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ABSTRACT

Designed to identify teaching-learning strategies that can be facilitated by the use of technology and to specify factors and configurations that have impact on computer use in the classroom, this second-year study of computer use in Indiana schools focused on the effects of computer use on students and on teachers, the curriculum implications of the use of computers, and logistical factors that contribute to their effective use in schools. The study combined an inferential approach with ethnographic methodology to reveal in as rich detail as possible the characteristics of the teaching-learning experience in classrooms using computer technology. The quasi-experimental design permitted an evaluation of a variety of usage categories as they are implemented in the everyday life of schools, i.e., computer labs, one-computer classrooms, team teaching, application minilabs, computer assisted instruction (CAI) minilabs, a self-contained classroom with computers in a ratio of 2:1, a take-home computer project (Buddy System), and an interactive video project. Data were collected through site visits, achievement test data, and teacher logs. Analyses of the data indicated that both students and teachers had positive attitudes toward the program; most of the teachers had added cooperative learning techniques to their teaching methods; computer use in classrooms where teachers treated the project as an "extra" became routine, sometimes boring, whereas teachers who integrated computer use into the curriculum became more facilitators of instruction than dispensers of information. Conditions contributing to the most successful integration were identified as sites that had Macintosh computers that demanded use of application rather than subject specific software; sites in which computers were rotated into classrooms and teachers found ways to integrate their use into their daily instruction; and one-computer classroom sites where teachers found appropriate software for involving students in cooperative learning and problem solving focused on content areas. Copies of interview probes and forms for test data reports and a project log, detailed descriptions of the usage categories, and a table showing CAI site assignments are appended. This report is preceded by an executive summary and followed by a second volume presenting summaries of individual site visits. (DB)

TAC. B. 154

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INDIANA'S FOURTH GRADE PROJECT

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EVALUATION OF MODEL APPLICATIONS OF COMPUTER TECHNOLOGY IN INDIANA CLASSROOMS: Second Year, 1989-1990

EXECUTIVE SUMMARY

Introduction

Computer use in American classrooms has increased dramatically over the last decade. With such an escalation in use, many educators have seen a need to study somewhat systematically the impact of such use on education. In 1988-89, a study was designed through the collaborative efforts of Advanced Technology and the Indiana Department of Education to evaluate the effectiveness of computer usage in schools around the state. The schools were selected on the basis of geographical distribution, willingness to participate, size, and availability of standardized test data. Where possible, schools with specific computer configurations available were selected and funded for prescribed computer applications. In other cases, schools were outfitted with the appropriate resources for the computer application. School personnel were given guidelines and training to implement specific computer applications. There were nine different applications--identified as **usage categories**--identified for study: computer lab, one computer/classroom, self-contained, team-teaching, application mini-lab, CAI mini-lab, WICAT, take-home, and videodisc. In most cases, three sites were identified for implementation of the category.

The study provided a wealth of information about the potential effects of computer applications on student learning and attitudes, teacher instruction and management, and on curricular integration. Many examples of exciting instruction using computers as integral tools emerged. Factors hindering effective application were also identified. Highlights of the first year included the following:

1. Computer use in instruction had a small positive effect on student achievement scores.

2. Computers had very positive effects on student attitudes toward learning.

3. Computers seemed to enhance students' problem-solving and reasoning abilities, but it was determined that more refined measures are needed to verify this effect.

4. Some teachers' instruction was changed substantially by the integration of computers, and some was changed only in minimal ways. This depended to a great extent on the particular usage category of application.

5. Teachers found that they had to be much better organized to incorporate computers, but that once they developed routines, the computers facilitated management tasks and reduced management time.

6. Many teachers discovered creative ways of integrating computers with instruction in productive and meaningful ways; some teachers struggled to find ways to integrate computer use.

These findings, as well as others, pointed to the need to study this project for another year of implementation.

Methodology

This study combined an inferential approach--to determine the size of the difference that computers can make on achievement--with ethnographic methodology--to reveal in as rich detail as possible the characteristics of the teaching-learning process in classrooms using computer technology. The quasi-experimental design permitted an evaluation of a variety of usage categories as they are implemented in the every-day life of schools. Since the use of computers in schools can vary substantially, a study of effective use must take into consideration a variety of factors. The approach was designed to assess the impact of programs which fit into a set of predetermined usage categories. This allowed generalizations to be made about the effectiveness of use based on the parameters established for a usage category.

Usage categories were established using an a priori list of criteria. This list was based on a review of the research literature and in conjunction with the Indiana Department of Education and a special task force of individuals with relevant knowledge and experience.

Usage categories established for the first-year study provided the structure for the current study, with the exception that WICAT sites were not included. The research categories used in the first-year study were expanded to reflect those issues that emerged from that study. Those categories were used as the basis for the design of data collection instruments used in the current study.

The usage categories are described briefly below. In addition to those described, two other types of sites were identified and discussed as ones which would be included in the study. No usage category descriptions were developed for these categories since they were existing models.

Computer Lab: Sites with existing computer labs were established to support a ratio of 2:1 with time allotments allowing for 30 minutes per day and 15 minutes per day to complete a keyboarding unit during initial training stages. Students use a variety of software that correlates with and enhances the classroom curriculum. Teachers use application and utility software.

One Computer/Classroom: One computer placed in a fourth grade classroom with a student/computer ratio of 22:1. Students have access to the computer throughout the day with subject area emphasis in math, science, and social studies. Application, simulation, and problem-solving software are used. Teacher presents software to students in a large group at least once a week and follows with a student-managed schedule of individual or small-group activities.

Team Teaching: Computer lab established between two classes with sufficient computers to allow a 4:1 ratio for student use. Computers remain stationary. With the exception of keyboarding, software is used that allows cooperation. Students are to rotate computer use for different subjects.

Application Mini Lab: Eight computer units are moved together from one classroom to the next. Each classroom has the use of the mini-lab for a minimum of one fourth of the school year. Teachers are provided with a computer to use at home. Teachers use application and utility software. Teachers and students use hypermedia to design presentations.

CAI Mini Lab: Eight computer units are moved together from one classroom to the next. Each classroom has the use of the mini-lab for a minimum of one fourth of the school year.

Self-Contained: Computers are established in one classroom to allow a ratio of 2:1. Computers are integrated in all subject areas. Students use computers 50 percent of the time allotted per subject. Students spend 15 minutes a day on keyboarding during the first six weeks of school. Application, simulation, and problem-solving software are used to provide enrichment and encourage creativity.

The other usage categories in the current study included a take-home computer project being implemented in Indiana (identified as Buddy System) and one interactive video project.

The current study focused on the same sites that implemented the project last year, with the exception of WICAT sites which chose not to participate for the second year. All sites implemented in fourth grade classes; fifth grade classes were included in a few cases where it was appropriate to do so. Three sites were selected in most categories.

Instrumentation. It was determined that not a great deal was learned from a broad distribution of pencil-and-paper surveys during the first-year study. Much more was learned from direct observation and interaction. However, since there was a need to have consistent information regarding relevant issues from all of the sites, it was determined that a set of interview probes would be developed that all staff members would use for gathering information. In this way, it was possible to obtain more detailed information about the most significant issues that had emerged from the first year of the study. At the same time, field staff were encouraged to explore at greater length any questions or issues that emerged at individual sites as they interviewed students, teachers, and principals.

Site Visits. Two visits to all of the sites participating in the study were scheduled. The first round of site visits took place in January and February, 1990; the second round took place in late April and May, 1990. Site visits were conducted by members of the Advanced Technology staff who were trained in observation and interview procedures. During site visits, field staff observed classrooms and computer labs and interviewed teachers, administrators, and students. The interviews were framed by the research probes that had been developed for use during all of the site visits. Field staff members expanded

the interviews or explored other issues as it was appropriate to do so. They also collected any documentation that contributed to an understanding of the implementation procedures and learning outcomes at the site.

Achievement Test Data. Achievement test data were collected from the districts to make before and after-program comparisons.
The current study made a comparison of individual student scores on the California Achievement Test (CAT) (drawn from ISTEP or from the fourth grade administration of CAT) for the 1988-89 school year (third grade scores) and from the 1989-90 school year (fourth grade scores). This was a departure from the procedure used in the first year of the study when fourth grade class data for spring, 1988, was compared to fourth grade class data for spring, 1989. Both are valid comparisons but allow different variables to operate.

Logs. Since it was most difficult for teachers to specify evidence that reflected improvement in achievement when they were being interviewed, a letter was distributed with accompanying logs for teachers to use when they observed such improvement or results in the classroom. It was thought that it would be easier to "catch" such data when it occurred, rather than retrospectively.

Coding. Field reports were coded according to research categories. These codes and salient comments were entered in a data base for the purpose of analyzing patterns and applying queries to establish relationships among findings. Data for probes requiring ranking or other such response were summed for overall results and for results by usage category.

Conclusions

Conclusions were based on the effectiveness of the usage categories by gleaning factors that contributed to the success of specific sites. These factors are typically drawn from different usage categories. In other words, while the results of this study may be used to rank the effectiveness of the various usage categories, in many cases, the factors that are identified as ones that contributed to success do not all come from one specific usage category.

Effects on Student Attitudes

The effects on student attitudes can be classified into two areas: **approach to the learning situation** and **working with others**. The positive effect of the program on student attitudes is easily one of the most noteworthy outcomes of this project. Almost every teacher involved in the project mentioned the positive feelings that students had about being involved in the project and about working on computers. It was clear that the integration of computers with their day-to-day curriculum served as an important motivation and stimulus for learning. Students in sites in all of the usage categories were involved in activities for some portion of their computer time that required problem solving or the use of discovery techniques, and many teachers commented on this fact.

Many teachers felt that the students worked very well on the computers because it was more of a "personalized interaction." This is an interesting phrase to use when you consider that one is talking about a machine versus a human teacher, but the comment related to the fact that students received immediate feedback, and the computer didn't "make judgments about student errors." Students could explore and experiment on their own at their own pace or in concert with one or two other students who were also curious about computer capability. In general, teachers felt that students were experiencing considerable excitement about learning in general and about learning with the computers, specifically.

Examples of comments include the following:

"They are more cooperative, helping each other; especially good for kids who don't relate well to pencil/paper even when it is the same activity; they are respectful of the computer and more willing to tackle the problem."

"They are more eager to learn, come ready to learn; there are far less behavior problems on computer days."

"Some with poor attitudes will kill to get on the computer, will also work more carefully."

"Students aren't afraid to try; the computer doesn't make fun of them."

There was considerable evidence that the emphasis on problem solving in all of the sites resulted in changes in students' persistence and "stick-to-it-tiveness" in solving problems that were presented on the computer or for which they were using the computer to assist them. Numerous teachers also commented on the positive effects on student writing, that they write longer pieces and edit more carefully. These kinds of outcomes--persistence in problem solving or more prolific writing--are not ones that are easily translated into improved test scores on standardized tests, but they are certainly ones that are keenly valued among educators--what we should be most interested in engendering in schools.

Another result related to student approach to learning had to do with students taking responsibility for their work and for their learning. When asked to describe the most non-computer change in teaching that had occurred as a result of involvement in the project, the teacher indicated that she is no longer so quick to provide the right answer. She now encourages students to try to figure out solutions and help one another.

The area that appeared to give students the most difficulty and which they identified as the most problematic thing about working on computers was keyboarding, "finding the right keys." This finding led to a specific recommendation that keyboarding always be addressed in some way when establishing an effective computer project. Students need to be freed up to use the computer as efficiently as possible. This is especially true with writing, since most teachers suggested, and, on their own initiative, most students chose to write their papers first and then enter them on the computer. They did so because they felt the keyboarding process slowed them down too much to allow their ideas to flow.

Cooperative Learning. Another very significant outcome of this project was the addition of cooperative learning techniques to the teaching methods of almost every teacher in the project and the positive results this had for student learning. Teachers were very pleased with the training they had prior to initiating the project this year, and they were very encouraged by the results they saw in their classrooms. It should be noted, however, that some of the cooperative mood that emerged resulted from the exploration of computer capability itself. In other words, teachers and students alike began to spontaneously help each other, assuming the role of mentor, teacher, or tutor as the situation demanded.

Interestingly, a number of comments about students serving as mentors for other students or learning and demonstrating software were focused on lower-achieving students who had found, in the computer, a way to shine. They found that the computer allowed them to learn at their own pace, without any sense of shame about their lack of ability, and once they experimented and learned, they shared their knowledge with others. Many other teachers commented that students became leaders and resource persons, not only within their classroom, but sometimes within the school.

One significant outcome noted from this project is one that was not part of the implementation design but relates to the development of significant cooperation between and among students. In several cases, teachers reported the spontaneous development of cooperative efforts between project students and lower primary or special education students, with the project students serving as tutors or mentors.

Effects on Student Learning: Interview Data

While positive effects on student learning would seem to be the outcome of greatest concern from a project such as this, it is the outcome that is most difficult to specify and on which to gather supportive data. The main reason for this is that the effects that teachers report--such as increased problem-solving ability, more sophisticated writing, enhanced decision-making and persistence in learning--are not ones that are measured by standardized tests. In addition, all of the usage category descriptions specified that teachers would use the computers to support instruction in science and social studies and either writing or math. The test scores that were available to use to assess student learning were in reading and math. The subject areas that were specified were not the same for each usage category, so one could not expect significant improvement in math when a usage category did not specify an emphasis on math.

One of the most noteworthy effects on student learning had to do with the assumption of responsibility for learning that was noted by many teachers, students, and principals. This fact resulted in a general improvement in students' ability to follow directions and to "figure things out". In a number of instances, teachers relinquished responsibility for learning a new piece of software (or, in some cases, even equipment, when a scanner was involved) to students who took on the task of learning it and teaching it to others. This fact struck the evaluators as something that has not traditionally happened in public schools.

In terms of their facility with computers, student learning really reflected a range. This was, as one might expect, directly related to the amount of time and the type of activities in which students were engaged. The students in self-contained classrooms, for example, seemed to demonstrate the most advanced keyboarding ability and a knowledge of a wide range of software. Most of it, however, was not application software. Students who were engaged in activities at sites where application software was more often the rule, demonstrated a greater ability to figure out a program or figure out ways to use the computer to assist them in their learning.

Several outcomes for student learning were generated from the advantages of a computer modem hookup. As an example, in one site, the students were developing a database of information on states. At another, the classes had called the Earthquake Center every few weeks and had plotted earthquakes on a world map. They had also called NASA and gotten answers to their questions about space and space exploration. As noted by one evaluator, "They (the students) were eager to share information, and this use of the computer definitely used the power of the computer to give students access to information that would be virtually impossible to glean from books."

Again, activities such as this and ones derived from the use of programs such as "Prodigy" in the IBM Buddy System site are ones that would not be part of traditional textbook learning. While these examples do not indicate specific impact on student learning, they demonstrate the opportunities for learning that were added by the implementation of the computer project.

Effects on Student Learning: Test Data

Test scores were compared using Normal Curve Equivalents (NCE), a scale that ranges from 1 to 99 with the average being 50. NCEs were used because they can be averaged. It should be noted that an average NCE gain of "0" means that the students maintained their positions. Anything above "0" indicates a gain that would not otherwise be expected, i.e., in the absence of treatment.

There were two major findings from the analysis of test data. Since this was only the second year of the project, and many of the teachers involved were new to the project, the positive results that were found in selected areas are encouraging and portend greater long-term benefits of the use of computers as an integral part of instruction. It is also important to make one qualification to the data. In three usage categories, **Computer Lab, One Computer/Classroom,** and **Application Mini-Lab**, the comparison of third grade to fourth grade scores for one class revealed unusually poor results, and these test scores skewed the overall results for the usage category. With only three schools (often with one class each, depending on the usage category) in each usage category, the N was not large enough to offset such outliers.

The two major findings from the analysis of the test results were as follows:

1. The greatest gains were in the area of reading, with the range for the usage categories being from **+ .1** to **+ 5.0**.

2. The most significant gains were made in the Self-Contained usage category. The significant results in math for this usage category represented the only positive results in math for the project as a whole. It should also be noted that the positive findings on test scores were, in general, positively correlated with the amount of time students had access to computers.

Effects on Teacher Attitudes

Overall, the evaluators felt that teacher enthusiasm and support for the project was still high the second year. The most commonly cited effect was professional growth and the increase in teacher comfort with technology. In one site, it was summarized by the evaluator in this way:

> The changes from last year to this year are most noticeable and most significant with the project teachers. They have grown and developed some important insights about the project. They are no longer on the great search for the perfect software; they are no longer in desperate need of outside experts and resources to solve their problems and to build/expand their knowledge base. They now realize that they hold the key to the success or failure of the project within themselves. And they seem confident and empowered to be able to do bigger and better things next year. Each year they have added considerably to their knowledge and experiential base, so that they now seem to know where they are going and have set a definite course to get there.

The comments that were made evidenced professional development that any educator would deem to be highly valued and beneficial for these teachers' students. Many teachers described their increased self-confidence and the fact that they had overcome fears, not only of technology, but of allowing students to take more responsibility for their learning and of becoming less authoritative in the classroom.

Another finding with regard to teacher attitudes had to do with the development of more initiative and open-mindedness on the part of a number of teachers. In one site, it was noted:

> The greatest success of the project to this point has not necessarily been realized by the 50 or so students who were in the project each year because of the limited time students spend using the computers. The greatest success seems, rather, to have been in opening up the teachers' minds to better ways for children to learn and motivating the teachers to grow as professionals.

Effects on Instruction/Classroom Management

The sites could easily be divided into two groups based on the general direction their projects took: one group treated the computer project as an "extra" that was added to their curriculum, and they used them to present students with isolated, fragmented activities using selected software; the other group made great strides in finding ways to meaningfully integrate computer use with their curriculum and their daily instruction. The first group was often found in sites that were identified as computer lab sites or sites that had turned the mini-lab concept into a computer lab. In these sites, computer use was routine, sometimes boring, remotely related to the curriculum, and occasionally frustrating to students when the software was not at an appropriate level or of much interest. Student and teacher attitudes about the computers could still be identified as positive, but the climate of these projects in terms of excitement and stimulation fell short when compared to sites where much application use was going on.

The second group of sites included teachers who had increased their flexibility enormously. They and their students planned ways to integrate computer use with their learning as they proceeded through regular classroom instruction. Teachers looked for new ways to teach science, social studies, or writing and often found them in serendipitous ways. They used more careful planning and recognized the need to be even more organized as teachers. They examined their plans carefully to consider the need for a meaningful purpose for computer use. Interestingly, this more often occurred in sites where there was a "computer presence" in the classroom and the restraints of the usage category demanded that the teacher find creative ways to integrate computer use.

In terms of classroom management, there were significant changes in what teachers did. Many mentioned the fact that they had become more facilitators of learning than dispensers of information, and this was evident in a variety of ways. Teachers generally released more responsibility to students--either for them to work together or to serve as mentors or peer tutors. In one CAI mini-lab, "The teacher talked of students getting along better, working more effectively with everyone contributing, and getting more work done. She also reported that leadership roles have also changed during the year. When teachers give up some of their role as director of all class activities, it is a great opportunity for students to assume leadership roles."

Many of the teachers realized that they had to adjust to a change in classroom climate as they incorporated cooperative learning techniques, assigned students to work in pairs or triads at computers, or involved students in projects.

Effects on Curricular Integration

The most difficult task for teachers to accomplish in this project has been the successful integration of computer use with the school's curriculum. Many of the teachers have had notable success in doing so, although in most cases, there might not have been integration with all subject areas; this was not a requirement of most of the usage categories in any case. The most successful integration occurred under three conditions:

1) sites that had Macintosh computers that demanded use of application software, rather than any packaged software related to various content areas;

2) sites in which the computers were rotated into the classrooms, and their presence demanded that the teachers find ways to integrate their use with their daily instruction;

3) one computer/classroom sites where the configuration and usage category description demanded that teachers find appropriate software for involving students in cooperative learning and problem-solving situations focused on content areas.

Summary and Recommendations

The purpose of this study was to identify new teaching/learning strategies that can be facilitated by the use of technology and to specify factors and configurations that have impact on computer use in the classroom. This purpose was richly fulfilled. Factors are identified below that the evaluators feel contributed significantly to the success of various sites.

1. **Location/Time**

Although it seems to be obvious, it should be stated that having adequate space and a comfortable arrangement of computers in a lab or classroom has a significant impact on the use of computers. It was also concluded that having one or more computers present in the classroom on a regular or rotating basis made a significant difference in terms of how well computer use was integrated with the curriculum and daily instruction. "Computer presence" made demands on the teacher to plan and orchestrate effective computer use.

With regard to time, "the more the better" is another obvious finding of the study. It is also obvious that if students are going to develop effective keyboarding skills (a factor identified by many teachers and students as a critical promoter or inhibitor of computer facility) that they need more time than can be arranged when time is limited by having only one computer or infrequent times for individual students to be at the keyboard. Time can be effectively enhanced by having students work in pairs or threes, but only if the activity involves all of the students in meaningful ways. (More than three students is not workable; two is preferable.) "The single computer concept would work most effectively," reported one evaluator, "if the teacher and class also had access to a school computer lab for perhaps one or two hours per week. This would allow for hands-on use which builds familiarity and confidence, would even out access (for all students), and would allow for more writing activities."

2. **Training/Support**

Teachers (and the evaluators) felt that more training and on-going support is really necessary to ensure effective computer use. While this was intended to be a "real-world" study--in that giving teachers new resources without extensive training would not be uncommon--it would make an enormous difference if teachers had something on the order of a week of hands-on training before beginning and regular intervention as they continued to explore. In this regard, in those sites where mutual support groups were possible (because more teachers were involved) or valued, there was much greater evidence of success. In the most successful site, teachers met faithfully every week for two years. Working collaboratively, having regular access to a mentor, or networking makes a tremendous difference in how successful teachers are in using computers in meaningful and interesting ways.

In one report, it was stated, "Another area that should be addressed is the need for time. Teachers need more time to prepare and receive training before school starts, more time and help in reviewing all the software available, more time and the opportunity to network with each other, and more time for the effective integration of the computer into the classroom. Perhaps a day of released time per month to work on these concerns could be allowed. Perhaps those teachers who are being given released time and who are serving as role models in their schools could also be expected to spend some of that time working with their colleagues to more effectively implement the computer into the curriculum." In addition, it was extremely valuable for each teacher to have access to one computer (often that they kept at home) on which to explore possibilities and learn software.

3. **Instruction**

What is commonly stated about what is needed in order to provide effective instruction is no less true here. First, teachers need a "vision" (unfortunately a word that has become a cliche when it is so important) of what they want to accomplish with the computer resource. Many of the teachers involved in this project constructed a vision for themselves based on initial input and on their own classroom explorations, and these teachers created exciting instruction with their students. Others never understood the value of this and used the computers as they would extra workbooks, or perhaps tape recorders.
Finding ways to meaningfully integrate computers with the curriculum, that is linking computers and curriculum, is also vital. This is not easy to accomplish, but with each successful application, more extensive connections become possible. In general, it seemed that the use of application software or problem-solving and simulation software made this linkage more feasible.

Finally, teachers definitely need to be flexible. They need to organize and plan instruction in different ways. They need to encourage cooperative learning

techniques and acquire a degree of comfort in acting more as a facilitator of learning than a dispenser of information. They need to step back and allow their students to take greater responsibility for their own learning. At some times, this will mean that the classroom is noisier, teeming with activity and student involvement. With consideration given to these factors, computers can, indeed must be, an essential learning tool for all classrooms.

(For more detailed information regarding implementation, problems, and highlights, one should read the specific site reports included in Volume II: Site Summaries. The reports are organized by usage category, so it is also possible to gain an understanding of factors related to each category by reading the reports for the specific usage category.)

INDIANA'S FOURTH GRADE PROJECT

MODEL APPLICATIONS OF TECHNOLOGY

Second Year, 1989-90

Volume I: Report of Findings

DECEMBER 1990

Beverly P. Farr, Project Director
Advanced Technology, Inc.

commissioned by

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EVALUATION OF MODEL APPLICATIONS OF COMPUTER TECHNOLOGY IN INDIANA CLASSROOMS: Second Year, 1989-1990

I. INTRODUCTION

Computer use in American classrooms has increased dramatically over the last decade. With such an escalation in use, many educators have seen a need to study somewhat systematically the impact of such use on education. Such studies have only been initiated in the last few years. Sheingold, et. al (1983) conducted three case studies in 1983 to consider this impact and to set a research agenda for the future. The trends which were identified as a basis for research are still the relevant issues: access to microcomputers, emergence of new roles in response to microcomputers; integration of microcomputers into elementary classrooms and curricula; quantity and quality of software; preparation of teachers for using microcomputers; and effects and outcomes of the instructional use of microcomputers.

In 1988-89, a study was designed through the collaborative efforts of Advanced Technology and the Indiana Department of Education to evaluate the effectiveness of computer usage in schools around the state. The schools were selected on the basis of geographical distribution, willingness to participate, size, and availability of standardized test data. Where possible, schools with specific computer configurations available were selected and funded for prescribed computer applications. In other cases, schools were outfitted with the appropriate resources for the computer application. School personnel were given guidelines and training to implement specific computer applications. There were nine different applications--identified as usage categories--identified for study: computer lab, one computer/classroom, self-contained, team-teaching, application mini-lab, CAI mini-lab, WICAT, take-home, and video disc. In most cases, three sites were identified for implementation of the category. Exceptions included four one computer/classroom sites, two WICAT sites, and one video disc site.

The study provided a wealth of information about the potential effects of computer applications on student learning and attitudes, teacher instruction and management, and on curricular integration. Many examples of exciting instruction using computers as integral tools emerged. Factors hindering effective application were also identified. Some of the conclusions that were drawn from that study are highlighted in the following section.

Highlights of Findings from First-Year Study

1. Computer use in instruction had a small positive effect on student achievement scores.

2. Computers had very positive effects on student attitudes toward learning.

3. Computers seemed to enhance students' problem-solving and reasoning abilities, but it was determined that more refined measures are needed to verify this effect.

4. Some teachers' instruction was changed substantially by the integration of computers, and some was not changed at all. This depended to a great extent on the particular usage category of application.

5. Almost all teachers responded quite positively to the use of computers in their classrooms. Some developed a sense of reinvigoration or renewal as a result of the opportunity to integrate computers with classroom instruction.

6. Although many of the teachers were given computers to have for their use at home, many chose to raise the ratio in the classroom by keeping them in the classroom. It was a finding, however, that those who kept them at home clearly benefited from the additional experimentation time at home.

7. Teachers found that they had to be much better organized to incorporate computers, but that once they developed routines, the computers facilitated management tasks and reduced management time.

8. Many teachers discovered creative ways of integrating computers with instruction in productive and meaningful ways; some teachers struggled to find ways to integrate computer use.

These findings, as well as others, pointed to the need to study this project for another year of implementation. The teachers participating in the project spent a great deal of time in the beginning of the 1988-89 school year becoming familiar with the computer and experimenting with configurations, activities, and software. By the end of the year, they were all expressing their eager anticipation about plans for potential use during the next school year. Training was provided for the 1989-90 school year, and funds were made available for software enhancements and teacher stipends. The current evaluation study (for the 1989-1990 implementation) was designed to parallel and follow up on the methodology pursued for the evaluation of the first year with slight variations as noted below.

Research Questions for the Current Study

The questions and subquestions posed for the second-year study of computer use in Indiana schools remained largely the same with small changes based on findings of the first-year study.

1. What are the effects of computer use on students?

   a. Does the regular use of a computer increase students' achievement test scores as measured by a standardized test?

   b. Does the regular use of a computer for a particular skill or subject increase students' achievement as indicated by other measures? What are the effects of computer use on students' reasoning skills?

   c. How does the use of a computer affect students' attitudes toward self and toward school, and toward the computer?

2. What are the effects of computer use on teachers?

   a. How much training in the use of microcomputers is necessary?

   b. What are the effects of computer use on instructional approaches and classroom management strategies used by teachers after two years of implementation?

   c. Are there other effects of computer use on teachers, such as the emergence of new roles, shifts in work groups, amount of preparation time, attitudes?

3. What are the curriculum implications of the use of computers?

   a. How does the nature and quality of the software affect the outcomes of use?

   b. How well and in what specific ways do teachers integrate computer use with the classroom curriculum? What changes are made in the curriculum to accommodate computer use?

4. What logistical factors contribute to the effective use of computers in a school?

   a. What are the features of computer location that contribute to efficient computer use?

   b. How many hours of computer use per week/month/year are needed in order to create an impact on achievement or attitudes?

   c. How many students working on a computer at a time seems most effective?

II. METHODOLOGY

General Approach to the Study

This study combined an inferential approach--to determine the size of the difference that computers can make on achievement--with ethnographic methodology--to reveal in as rich detail as possible the characteristics of the teaching-learning process in classrooms using computer technology. The quasi-experimental design permitted an evaluation of a variety of usage categories as they are implemented in the every-day life of schools. Since the use of computers in schools can vary substantially, a study of effective use must take into consideration a variety of factors. The approach was designed to assess the impact of programs which fit into a set of predetermined usage categories. This allowed generalizations to be made about the effectiveness of use based on the parameters established for a usage category.

It is important to note that when the work was initiated for implementation during the 1988-89 school year, a vision statement was formalized that would give direction to the study. That statement was as follows:

> All Indiana students in the elementary middle grades will be productively engaged in learning pursuits that are tailored to their needs. The task force in middle grade education has developed models which use technology to facilitate changes in the teaching-learning process. Students are full partners in the process, actively involved in selecting activities that fit teachers to change their roles from simply dispensers of information to designers of cooperative learning relationships with students.
>
> Administrators will fulfill their role as partners in this venture by establishing an atmosphere for change and providing progressive leadership. The Department of Education has commissioned a study of applications of technology to evaluate these models and make recommendations.

Usage categories were established using an <u>a priori</u> list of criteria. This list was based on a review of the research literature and in conjunction with the Indiana Department of Education and a special task force of individuals selected by the Department as ones with relevant knowledge and experience. The task force met for three days in June, 1988, to consider the intent and design of the study for implementation during the 1988-89 school year.

Criteria that were considered included the following:

- o setting;
- o ratio of students to computers;
- o format of use when students are at the computer;
- o subject area(s) for instruction;
- o type of software program(s);
- o time spent by students at the computer;
- o target group; and,
- o use by teacher for demonstration.

The usage categories were not established by considering all of the possible combinations of characteristics but by considering those which seemed to compel research interest. Configurations which have been investigated in other research studies or for which there is considerable research data available were not included. Once the usage categories were established, the specific sampling and implementation procedures were outlined, and participation by school sites was solicited.

Preparation for Data Collection

Usage categories established for the first-year study provided the structure for the current study, with the exception that WICAT sites were not included. The research categories used in the first-year study were expanded to reflect those issues that emerged from that study. Those categories were used as the basis for the design of data collection instruments used in the current study.

The usage categories are described briefly below and more fully in the usage category descriptions included in Appendix B. In addition to those described, two other types of sites were identified and discussed as ones which would be included in the study. No usage category descriptions were developed for these categories since they were existing models.

Computer Lab: Sites with existing computer labs were established to support a ratio of 2:1 with time allotments allowing for 30 minutes per day and 15 minutes per day to complete a keyboarding unit during initial training stages. Students use a variety of software that correlates with and enhances the classroom curriculum. Teachers use application and utility software.

One Computer/Classroom: One computer placed in a fourth grade classroom with a student/computer ratio of 22:1. Students have access to the computer throughout the day with subject area emphasis in math, science, and social studies. Application, simulation, and problem-solving software are used. Teacher presents software to students in a large group at least once a week and follows with a student-managed schedule of individual or small-group activities.

Team Teaching: Computer lab established between two classes with sufficient computers to allow a 4:1 ratio for student use. Computers remain stationary. With the exception of keyboarding, software is used that allows cooperation. Students are to rotate computer use for different subjects.

Application Mini Lab: Eight computer units are moved together from one classroom to the next. Each classroom has the use of the mini-lab for a minimum of one fourth of the school year. Teachers are provided with a computer to use at home. Teachers use application and utility software. Teachers and students use hypermedia to design presentations in the targeted subject areas.

CAI Mini Lab: Eight computer units are moved together from one classroom to the next. Each classroom has the use of the mini-lab for a minimum of one fourth of the school year.

Self-Contained: Computers are established in one classroom to allow a ratio of 2:1. Computers are integrated in all subject areas. Students use computers 50 percent of the time allotted per subject. Students spend 15 minutes a day on keyboarding during the first six weeks of school. Application, simulation, and problem-solving software are used to provide enrichment and encourage creativity.

The other usage categories in the current study included a take-home computer project being implemented in Indiana (identified as Buddy System) and one interactive video project.

Identification of research categories. A review of the literature and work with the task force that initiated this study led to the development of a list of research categories that were set as a priori categories. This list includes specific factors to take into consideration when evaluating the effectiveness of each project, e.g. classroom management, time and accessibility to

computers, attitudes, etc. It served as a basis of consideration when field staff made observations and conducted interviews during site visits. It was also used to develop a coding system for reducing and synthesizing the qualitative data.

Site Contacts. The current study focused on the same sites that implemented the project last year, with the exception of WICAT sites which chose not to participate for the second year. All sites implemented in fourth grade classes; fifth grade classes were included in a few cases where it was appropriate to do so. Three sites were selected in most categories; exceptions included four sites in the One Computer/Classroom category and one Video site. Each site included between one and four classrooms. (See site matrix in Appendix C.)

As a preliminary step to data collection, all of the sites were contacted to inform personnel of the research needs and the procedures to be used in data collection. Since most of those participating in the current project were involved last year as well, the process of establishing rapport was not a difficult one.

Initial contact with schools provided the opportunity to clarify relevant issues and to discuss scheduling of site visits. Questions related to accessibility of test data and the testing requirements of the study were addressed during the initial contact.

Scheduling. Visits to all of the sites participating in the study were scheduled for once in the fall and once in the spring. However, as there was a significant delay in the contract negotiation, the first round of visits was not conducted until the beginning of the second semester. The second round was conducted as close to the end of the school year as possible, in order to provide the largest window of time between visits. Factors that were taken into consideration in establishing a schedule for site visits included: district schedules, implementation strategies in each site, and travel planning.

Training. Training for field staff was provided before site visits were scheduled. Since there were a few new ATI staff members participating in the evaluation, the training was designed by those who participated in the first-year study. This included a review of the report of the first-year study, project descriptions, relevant research issues, and field study procedures. Interview protocols were developed for use during site visits. Field staff were also trained to use a format for field notes that permitted coding of salient information according to the research categories of interest.

Instrumentation. As the staff prepared for the site visits and provided background information for new field staff, the relevant issues and procedures for collecting data were discussed at length. It was determined that not a great deal was learned from a broad distribution of pencil-and-paper surveys. Much more was learned from direct observation and interaction. However, since there was a need to have consistent information regarding relevant issues from all of the sites, it was determined that a set of interview probes would be developed that all staff members would use for gathering information. In this way, it was possible to obtain more detailed information about the most significant issues that had emerged from the first year of the study. At the same time, field staff were encouraged to explore at greater length any questions or issues that emerged at individual sites as they interviewed students, teachers, and principals. The development of the interview probes took into account the findings of the first-year study and focused on those questions or issues for which significant changes were anticipated. The interview probes were modified slightly for the second round of site visits. (See Appendix A for research instruments.)

Data Collection

Site Visits. The first round of site visits took place in January and February, 1990; the second round took place in late April and May, 1990. Site visits were conducted by members of the Advanced Technology staff who were trained in observation and interview procedures. During site visits, field staff observed classrooms and computer labs and interviewed teachers, administrators, and students. The interviews were framed by the research probes that had been developed for use during all of the site visits. Field staff members expanded the interviews or explored other issues as it was appropriate to do so. They also collected any documentation that contributed to an understanding of the implementation procedures and learning outcomes at the site.

Achievement Test Data. Achievement test data were collected from the districts to make before and after-program comparisons. The current study made a comparison of individual student scores on the California Achievement Test (CAT) (drawn from ISTEP or from the fourth grade administration of CAT) for the 1988-89 school year (third grade scores) and from the 1989-90 school year (fourth grade scores). This was a departure from the procedure used in the first year of the study when fourth grade class data for spring, 1988, was compared to fourth grade class data for spring, 1989. Both are valid comparisons but allow different variables to operate. School were asked to complete a form on which matched scores for students could be listed for third and fourth grade or to send the computer printouts so that ATI could complete the matching task. (See Appendix B for test data collection form.)

Logs. Since it was most difficult for teachers to specify evidence that reflected improvement in achievement when they were being interviewed, a letter was distributed with accompanying logs for teachers to use when they observed such improvement or results in the classroom. It was thought that it would be easier to "catch" such data when it occurred rather than retrospectively.

Data Analysis

Coding. Field reports were coded according to research categories. These codes and salient comments were entered in a data base for the purpose of analyzing patterns and applying queries to establish relationships among findings. Data for probes requiring ranking or other such response were summed for overall results and for results by usage category.

Pre/Post Test Data Analysis. District achievement test data from the 1988-89 administration of ISTEP to third graders and from the 1989-90 administration of CAT to fourth graders (i.e., before and after the implementation of computer-assisted instruction) were analyzed to assess learning outcomes.

III. FINDINGS: The Issues

The following section represents the conclusions drawn from all of the site reports, quantitative data, and other documentation. It is important to note that none of the conclusions discussed in this section was reached without triangulating or supporting that conclusion from a number of different sources.

For more detailed information regarding implementation, problems, and highlights, one should read the specific site reports included in Volume II: Site Summaries. The reports are organized by usage category, so it is also possible to gain an understanding of factors related to each category by reading the reports for the specific usage category. In this section, conclusions will be drawn regarding the effectiveness of the usage categories by gleaning factors that contributed to the success of specific sites. These factors are typically drawn from different usage categories. In other words, while the results of this study may be used to rank the effectiveness of the various usage categories, in many cases, the factors that are identified as ones that contributed to success do not all come from one specific usage category.

The reader should note that quotes from site summaries are identified for usage category by the codes in parentheses using the following coding scheme:

CL - computer lab
OC - one computer/classroom
TT - team teaching
IL - CAI mini-lab
AL - application mini-lab
SC - self-contained
BS - Buddy System
VD - video disc

It should also be noted that specific quotes are selected because they are considered to be representative of the general finding.

Effects on Student Attitudes

The effects on student attitudes can be classified into two areas: approach to the learning situation and working with others. That is to say, almost every comment or finding with regard to student attitudes fell into these two areas, and the findings could all be considered to be significant. The positive effect of the program on student attitudes is easily one of the most noteworthy outcomes of this project.

Approach to learning. Almost every teacher involved in the project mentioned the positive feelings that students had about being involved in the project and about working on computers. They referred to the sense of enthusiasm and excitement; several mentioned that students felt "privileged" to be involved. It was clear that the integration of computers with their day-to-day curriculum served as an important motivation and stimulus for learning. Students in sites in all of the usage categories were involved in activities for some portion of their computer time that required problem solving or the use of discovery techniques, and many teachers commented on this fact. As stated by one student, "You learn something, and you get to have a good time. It isn't like real classwork where you don't have fun. You get to talk about it to your classmates and figure it out." (OC)

It was also common for site visitors to note that the tone and quality of teachers' comments changed by the second visits, as students became more sophisticated and knowledgeable about computer use. For example, one evaluator stated: "At the first visit, (the teachers) mentioned computer literacy and familiarity, cooperation, creativity, and independence." By the second visit, their comments were qualitatively different: "Students enjoyed learning and will retain more of the information"; "The joy of doing something unexpected and having it be right, the freedom to experiment"; "Sharing ideas, working together, feeling pride in a finished product"; "I feel any time spent on a computer better prepares them for a future job. They also learned about many different options--spreadsheets, databases, and card stacks." The teachers had reported goals for the students of being more comfortable with the computer and familiar with the programs and their applications. They wanted them to "expand their vision of what the computer can do." (AL)

Many teachers felt that the students worked very well on the computers because it was more of a "personalized interaction." This is an interesting phrase to use when you consider that one is talking about a machine versus a human teacher, but the comment related to the fact that students received immediate feedback, and the computer didn't "make judgments about student errors." Students could explore and experiment on their own at their own pace or in concert with one or two other students who were also curious about computer capability. In general, teachers felt that

students were experiencing considerable excitement about learning in general and about learning with the computers, specifically.

To sum up many of the comments that were made about the effects on student attitudes, the following set of statements is taken from a report on a CAI mini-lab site:

> "They are building self-esteem, finding success."
>
> "They are more cooperative, helping each other; especially good for kids who don't relate well to pencil/paper even when it is the same activity; they are respectful of the computer and more willing to tackle the problem."
>
> "They are more eager to learn, come ready to learn; there are far less behavior problems on computer days."
>
> "Some with poor attitudes will kill to get on the computer, will also work more carefully."
>
> "Students aren't afraid to try; the computer doesn't make fun of them."

There was considerable evidence that the emphasis on problem solving in all of the sites resulted in changes in students' persistence and "stick-to-it-tiveness" in solving problems that were presented on the computer or for which they were using the computer to assist them. Many teachers noted that "they don't give up." Numerous teachers also commented on the positive effects on student writing, that they write longer pieces and edit more carefully. One teacher commented that "several students were reluctant to write poems, stories, etc. at the beginning of the school year but really enjoy doing it now because of the ease of writing using the word processor." These kinds of outcomes--persistence in problem solving or more prolific writing--are not ones that are easily translated into improved test scores on standardized tests, but they are certainly ones that are keenly valued among educators. They should be outcomes that we are most interested in engendering in schools.

Another result related to student approach to learning had to do with students taking responsibility for their work and for their learning. An evaluator commented about a teacher in a computer lab site:

> She saw students benefitting from the project in two major ways. Students are now taking more responsibility for their own learning and are working at their own pace instead of the pace being set and monitored by her. In addition, she sees the lower-achieving student being able to accomplish more because of the computer.

When asked to describe the most non-computer change in teaching that had occurred as a result of involvement in the project, the teacher indicated that she is no longer so quick to provide the right answer. She now encourages students to try to figure out solutions and help one another.

The area that appeared to give students the most difficulty and which they identified as the most problematic thing about working on computers was keyboarding, "finding the right keys." This finding led to a specific recommendation that keyboarding always be addressed in some way when establishing an effective computer project. Students need to be freed up to use the computer as efficiently as possible. This is especially true with writing, since most teachers suggested, and, on their own initiative, most students chose to write their papers first and then enter them on the computer. They did so because they felt the keyboarding process slowed them down too much to allow their ideas to flow.

Cooperative Learning. Another very significant outcome of this project was the addition of cooperative learning techniques to the teaching methods of almost every teacher in the project and the positive results this had for student learning. Teachers were very pleased with the training they had prior to initiating the project this year, and they were very encouraged by the results they saw in their classrooms. While this was not 100% true, because there were a few teachers who commented that their groups this year were "immature" or "unmanageable" and could not adapt well to a cooperative approach, the majority had experimented with the approach and had met great success. It should be noted, however, that some of the cooperative mood that emerged resulted from the exploration of computer capability itself. In other words, teachers and students alike began to spontaneously help each other, assuming the role of mentor, teacher, or tutor as the situation demanded.

Interestingly, a number of comments about students serving as mentors for other students or learning and demonstrating software were focused on lower-achieving students who had found, in the computer, a way to shine. They found that the computer allowed them to learn at their own pace, without any sense of shame about their lack of ability, and once they experimented and learned, they shared their knowledge with others. Many other teachers commented that students became leaders and resource persons, not only within their classroom, but sometimes within the school. As an example, it was remarked that the students in one site "are frequently asked to provide some hands-on assistance when other classes are in the lab and are having problems with the computers or with the software. In fact, the project students are known as Jefferson's computer technicians and are responsible for making sure the computers are turned off and for putting the software away at the end of each day. They also serve as troubleshooters when problems arise." (OL)

One significant outcome noted from this project is one that was not part of the implementation design but relates to the development of significant cooperation between and among students. In several cases, teachers reported the spontaneous development of cooperative efforts between project students and lower primary or special education students, with the project students serving as tutors or mentors. All that were involved reported positive results for this sort of activity, and it is certainly one that harmonizes with a generous body of research demonstrating the positive effects of peer or cross-age tutoring. It is just nice to know that this can happen very naturally using the computer as the vehicle.

When students were asked about their preferences for working alone at the computer or with other students, there was a mixed response. In general, however, the following conclusions can be drawn:

1) Students who commonly worked alone at computers, such as in the self-contained sites or in sites where the teacher tried to maintain a 1:1 ratio, generally expressed a preference for working alone and made quite strong statements about not wanting to be "bothered" or "someone to tell you what to do all the time."

2) Students who reported that they liked working with others often qualified their statements by saying that it was especially true when they were working on problem-solving or simulations where the cooperative effort really had pay-off.

Effects on Student Learning: Interview Data

While positive effects on student learning would seem to be the outcome of greatest concern from a project such as this, it is the outcome that is most difficult to specify and on which to gather supportive data. The main reason for this is that the effects that teachers report--such as increased problem-solving ability, more sophisticated writing, enhanced decision-making and persistence in learning--are not ones that are measured by standardized tests. In addition, all of the usage category descriptions specified that teachers would use the computers to support instruction in science and social studies and either writing or math. The test scores that were available to use to assess student learning were in reading and math. The subject areas that were specified were not the same for each usage category, so one could not expect significant improvement in math when a usage category did not specify an emphasis on math.

A number of the teachers mentioned the positive effect on student learning, but few were able to specify evidence to support their opinions. With the hope that some of this evidence might be gathered to report effects on achievement noted as they happened, teachers were asked to fill out logs and report evidence of impact. While many did respond using this format, the logs represented a range of outcomes, most of which did not reflect specifically on achievement. They did, however, document a nice range of instructional activities.

The effects on student learning are drawn first from all of the documentation, interview data, and site summaries. Secondly, the results of a comparison of student test data is presented.

One of the most noteworthy effects on student learning had to do with the assumption of responsibility for learning that was noted by many teachers, students, and principals. This fact resulted in a general improvement in students' ability to follow directions and to "figure things out". As one evaluator stated, "Some children have been given programs and instructions to figure out how they work. The teacher has seen creativity in this process, as they have pursued the solution differently from the way in which she would have, but still reached the same end point in being able to demonstrate the programs to their classmates effectively." (OL)

In a number of instances, teachers relinquished responsibility for learning a new piece of software (or, in some cases, even equipment, when a scanner was involved) to students who took on the task of learning it and teaching it to others. This fact struck the evaluators as something that has not traditionally happened in public schools.

In terms of their facility with computers, student learning really reflected a range. This was, as one might expect, directly related to the amount of time and the type of activities in which students were engaged. The students in self-contained classrooms, for example, seemed to demonstrate the most advanced keyboarding ability and a knowledge of a wide range of software. Most of it, however, was not application software. Students who were engaged in activities at sites where application software was more often the rule, demonstrated a greater ability to figure out a program or figure out ways to use the computer to assist them in their learning. As reported for one application mini-lab site, "Student comments also reflected a change from the first to second site visit. At the first visit, students reported liking to write stories best, although one indicated that he liked working on the Hypercard project on the states. By the second visit, students were consistent in reporting that they liked working on their research projects, the planets, the ocean floor, solar system; they also reported that they liked experimenting, learning the computer's capability." In the beginning, when asked about what made the computer "fun", they said things like, "Your hand gets

tired writing (with a pencil)", or they said they didn't know. By the end of the year, they made comments such as, "You get to do things you didn't know about" and "learning about technology."

Many teachers mentioned the improvement in students' problem-solving ability and their willingness to approach problems. "In fact," wrote one evaluator, "teachers report that they see the largest growth in the area of problem solving. One teacher stated, 'They think, discuss, conclude...it's great!'" (IL) Other teachers noted that they really had seen carryover to their other classroom activities in terms of student work habits, approach to problems, and research abilities. One teacher noted specifically that the students were more willing to do long division on the computer.

Several outcomes for student learning were generated from the advantages of a computer modem hookup. As an example, in one site, the students were developing a database of information on states. As noted by the evaluator, "The students were proud of the printouts they were generating from the database of states. When back in the regular classroom, they showed the evaluator other state-specific materials they had generated and printed from the database of states. They were eager to share information, and this use of the computer definitely used the power of the computer to give students access to information that would be virtually impossible to glean from books."

In another site, a consultant had created a fictitious character who communicated with the students about his travels, and the students tracked his progress using an atlas. Often they gathered details about landmarks that he should visit and communicated the information to him. When they did not hear from the character for a while, they became quite concerned. At this same site, the classes have called the Earthquake Center every few weeks and have plotted earthquakes on a world map. "They've also called NASA and gotten answers to their questions about space and space exploration." (TT) Again, activities such as this and ones derived from the use of programs such as "Prodigy" in the IBM Buddy System site are ones that would not be part of traditional textbook learning. While these examples do not indicate specific impact on student learning, they demonstrate the opportunities for learning that were added by the implementation of the computer project. Perhaps the following comment about the teachers' reactions in the aforementioned site captures the effects on student learning:

> Teachers indicate that their students have learned to listen and follow directions carefully during computer lessons, so they don't get behind. They also work more quickly because they know they have a limited amount of time in the lab. Teachers noticed that the children in general, but the poor writers and spellers in particular, take great pride in their writings which are printed out. Creativity in writing has

improved with students' increased desire to write, according to one of the teachers. The ability to solve problems has improved--especially when a lower-achieving student is paired with a higher-achieving student.

Effects on Student Learning: Test Data

Schools included in the project were asked to submit test data for students in the project in 1989-90 (mostly fourth graders) along with test scores for these same students when they were in third grade (1988-89). Either the schools recorded the scores on a special form supplied by ATI, or they submitted computer printouts, and ATI did the matching. This meant that for purposes of this year's study:

> Fourth graders' CAT scores in Reading, Math and Total Battery were compared to their CAT (from ISTEP) scores when they were in third grade.

The results were compared using Normal Curve Equivalents (NCE), a scale that ranges from 1 to 99 with the average being 50. NCEs were used because they can be averaged. It should be noted that an average NCE gain of "0" means that the students maintained their positions. Anything above "0" indicates a gain that would not otherwise be expected, i.e., in the absence of treatment.

There were two major findings from the analysis of test data. Since this was only the second year of the project, and many of the teachers involved were new to the project, the positive results that were found in selected areas are encouraging and portend greater long-term benefits of the use of computers as an integral part of instruction. It is also important to make one qualification to the data. In three usage categories, Computer Lab, One Computer/Classroom, and Application Mini-Lab, the comparison of third grade to fourth grade scores for one class revealed unusually poor results, and these test scores skewed the overall results for the usage category. With only three schools (often with one class each, depending on the usage category) in each usage category, the N was not large enough to offset such outliers.

In the case of the Application Mini-Lab in Perry Central, an additional note of explanation or qualification seems necessary. In this site, there were two fourth grade and two fifth grade classes in the project, but only the fourth grade scores were submitted because of the framework of the data analysis. While this had to be the way it was done, it was the two fifth grade classes in this site that were considered exemplary in the overall project, to some extent as a result of the additional experience of the teachers and students. The test results for one of the fourth grade classes at this site were unfortunately

extraordinarily negative, and there does not seem to be any obvious explanation for this. Hence the results for this site and this usage category were, in all likelihood, not an accurate indication of the outcome.

The two major findings from the analysis of the test results were as follows:

1. The greatest gains were in the area of reading, with the range for the usage categories being from +.1 to + 5. The reading results were distributed as follows:

Results in Reading by Usage Category	
Team Teaching	+ 5.3
Self Contained	+ 5.0
CAI Mini-Lab	+ 2.0
Buddy System	+ .9
Application Mini-Lab	+ .1
One Computer/Classroom	- 1.0
Computer Lab	- 2.0

2. The most significant gains were made in the Self-Contained usage category with the results being as follows:

Results for Self-Contained Sites	
Reading	+ 5.0
Math	+13.0
Total Battery	+11.0

The significant results in math for this usage category represented the only positive results in math for the project as a whole. It should also be noted that the positive findings on test scores were, in general, positively correlated with the amount of time students had access to computers.

Effects on Teacher Attitudes

Overall, the evaluators felt that teacher enthusiasm and support for the project was still high. This must be qualified, however, by saying that there were individual teachers and sites where this was not quite true for a variety of reasons. In the case of one site, it was because the computers had been borrowed over the summer and returned in a condition that precluded using them for several months. This had a very dampening effect on the project. In the cases of other sites, it was because they had not been very successful last year, had not found effective ways to integrate the computers and so had no momentum on which to build. For a few teachers who were new to their school and to the project, it was difficult to become meaningfully involved; for one teacher, an extended illness delayed her return to "full spirit".

The above noted exceptions should not, however, overshadow the general appreciation and excitement that most teachers still had for the project. The most commonly cited effect was their own professional growth and the increase in their comfort with technology. In a team teaching site, it was summarized by the evaluator in this way:

> The changes from last year to this year are most noticeable and most significant with the project teachers. They have grown and developed some important insights about the project. They are no longer on the great search for the perfect software; they are no longer in desperate need of outside experts and resources to solve their problems and to build/expand their knowledge base. They now realize that they hold the key to the success or failure of the project within themselves. And they seem confident and empowered to be able to do bigger and better things next year. Each year they have added considerably to their knowledge and experiential base, so that they now seem to know where they are going and have set a definite course to get there.

A comment from an evaluator at one of the most successful sites (AL) also reflected the professional growth made by many teachers:

> The teachers generally exude a real confidence in what they are doing as meaningful to their students. They feel genuine pride in their accomplishments and how far they have come in a little more than a year. One teacher talked about now being considered a respected resource on computers, when at the beginning of last year she knew absolutely nothing. One teacher said she now knows how kids feel as they are learning, and that she feels confident to learn along with them, rather

than having all the answers. A benefit for her students, one teacher expressed, is "a more energetic teacher," which says a lot about the power of renewal in the implementation of meaningful educational change.

The comments above certainly evidence professional development that any educator would deem to be highly valued and beneficial for these teachers' students. As noted in the latter comment above, many teachers described their increased self-confidence and the fact that they had overcome fears, not only of technology, but of allowing students to take more responsibility for their learning and of becoming less authoritative in the classroom.

Another finding with regard to teacher attitudes had to do with the development of more initiative and open-mindedness on the part of a number of teachers. Several teachers had initiated summer computer projects for students in their schools, in some cases for students who were not involved in the project. Evidence of teachers' increased open-mindedness was reported in a team-teaching site:

> The greatest success of the project to this point has not necessarily been realized by the 50 or so students who were in the project each year because of the limited time students spend using the computers. The greatest success seems, rather, to have been in opening up the teachers' minds to better ways for children to learn and motivating the teachers to grow as professionals.

After spending considerable time on what some evaluators have referred to the "magic software hunt"--to find software that will solve all of their instructional problems and satisfy the requirements of the project, many teachers finally learned that they would have to take the initiative and think about ways to effectively integrate computer use. It was reported in another team-teaching site (though this was not true only of this usage category) that:

> They discovered during the latter part of the first year, after spending much time and effort previewing an enormous amount of software, that there's not much good software available in the content areas. Last year they used mostly what was available and were not satisfied with the quality. This year they used the strategy of first deciding what they wanted to accomplish in both the science and social studies curricula and then figuring out how the computer could be used to do what they needed to do.

Effects on Instruction/Classroom Management

The sites could easily be divided into two groups based on the general direction their projects have taken: one group treated the computer project as an "extra" that was added to their curriculum, and they used them to present students with isolated, fragmented activities using selected software; the other group made great strides in finding ways to meaningfully integrate computer use with their curriculum and their daily instruction. The first group was often found in sites that were identified as computer lab sites or sites that had turned the mini-lab concept into a computer lab. In these sites, computer use was routine, sometimes boring, remotely related to the curriculum, and occasionally frustrating to students when the software was not at an appropriate level or of much interest. Student and teacher attitudes about the computers could still be identified as positive, but the climate of these projects in terms of excitement and stimulation fell short when compared to sites where much application use was going on.

In a summary to one of the site reports that exemplified this state of affairs, the evaluator stated it as follows:

> This project has never gained a direction or vision of what could happen or was supposed to happen. The teachers viewed any and all software that they came across as potentially important for their classroom. The criteria seemed to be if the teacher understood it, the students liked it, and it made some sense in the grand scheme of their classrooms, then it should be used. This fact seems to support the point of view that being a good classroom teacher (as these teachers are) does not necessarily provide the wherewithal to plan and implement meaningful computer activities to enhance student learning without specific guidance and systematic, on-going support and nurturing. (IL)

The second group of sites included teachers who had increased their flexibility enormously. They and their students planned ways to integrate computer use with their learning as they proceeded through regular classroom instruction. Teachers looked for new ways to teach science, social studies, or writing and often found them in serendipitous ways. They used more careful planning and recognized the need to be even more organized as teachers. They examined their plans carefully to consider the need for a meaningful purpose for computer use. Interestingly, this more often occurred in sites where there was a "computer presence" in the classroom and the restraints of the usage category demanded that the teacher find creative ways to integrate computer use. The following two examples are from two different one computer/classroom sites:

Another (idea apparent to the evaluator) was the strength of the teacher's feelings about using the computer in as many ways as possible and relegating the text to the status of a reference. Flexibility became increasingly important to her, in the use of the computer and texts, but also in grouping and time for classwork. This is particularly significant because she described herself last year as a very traditional type teacher with close classroom control, everyone sitting in neat rows, working on the same assignments.

This year the project teacher has enjoyed watching her students grow in their knowledge of technology and watching their excitement increase. She indicated that in her classroom, textbooks are used as supplements and resources that don't drive instruction.

Another example came from a teacher in a CAI mini-lab site: "(The teachers) felt they were no longer 'stuck in a rut', that they were teaching more problem solving, rather than strictly by the book. 'Looking back,' commented one teacher, 'I realize how rigidly I stuck to the book; there is much more divergent thinking now, and I plan differently.'"

Many of the teachers used the computer for demonstrations, usually using an LCD device. While there were some teachers who simply could not adapt the use of such a device, those who went to the trouble found that it was well worth it.

A few teachers used video disc software to present materials. For example, "Students were having a science lesson on animals using their textbook. During the reading and discussion of the material, the teacher was using the large monitor and paging through material about mammals on a science disc to find examples that further explained what was in the text. This was an encyclopedic type of reference which helped broaden children's understanding of the topic." (OC)

In terms of classroom management, there were significant changes in what teachers did. Many mentioned the fact that they had become more facilitators of learning than dispensers of information, and this was evident in a variety of ways. Teachers generally released more responsibility to students--either for them to work together or to serve as mentors or peer tutors. In one CAI mini-lab, "The teacher talked of students getting along better, working more effectively with everyone contributing, and getting more work done. She also reported that leadership roles have also changed during the year. When teachers give up some of their role as director of all class activities, it is a great opportunity for students to assume leadership roles."

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Many of the teachers realized that they had to adjust to a change in classroom climate as they incorporated cooperative learning techniques, assigned students to work in pairs or triads at computers, or involved students in projects. The description below really exemplifies the kind of positive learning situation that can result from meaningful integration of computer use.

> Students worked in groups of four, so all eight of the computers were not being directly used by work groups. There is division of labor among members of the group with only one or two working at the computer. The other group members are working at their desk or going to the library to look for information. Roles alternate per a group-agreed-upon schedule. Students leave the classroom to go to the library during this time without telling the teacher. The teacher reported there has been no observed or reported problem with this. Students have a reason to go, are motivated, and stay on task. Later during the visit the librarian was questioned, and she reported that it worked well when these students came to the library.

Children in these projects have had many opportunities for cooperative learning, although it should be noted that where joint decision making did not really occur, cooperative learning was reduced to simply sitting at the computer at the same time. Indeed, in some cases, it seemed that this was what some teachers identified as cooperative learning. With additional experience, it seems likely that the teachers will refine these procedures and distinguish between simply working together and learning through cooperative efforts.

In Tables 1-4, the results of the interview probes which asked students and teachers about the amount of time spent in various computer activities are presented. Each of the tables includes response frequencies for each of four questions. The questions were asked of students and teachers during interviews, and they focused on frequency of computer use for various activities and subjects. On the student interview, it was question #8, and on the teacher interview, it was question #13. The results for each of the questions is presented for the first round of site visits and for the second round. The questions and codes for each of the usage categories and response options are presented at the bottom of each table.

Each number represents the number of times a response was given, e.g. "not at all," "some," or "often".

Table 1

Student Question Sort x Usage
Question 8
first round

	All			CL			OC			TT			IL			AL			SC			TN		
	N	S	O	N	S	O	N	S	O	N	S	O	N	S	O	N	S	O	N	S	O	N	S	O
Practice math	12	29	25	1	3	4	0	7	4	6	4	0	0	3	3	1	4	4	2	3	6	2	4	4
Write	14	36	15	1	5	2	2	6	2	6	1	3	0	6	0	2	5	2	0	9	2	2	4	4
Type after writing	26	28	14	5	3	0	8	2	1	4	4	2	1	2	3	2	3	4	2	8	1	1	6	3
Keyboarding	21	29	17	2	2	4	7	3	0	1	5	4	1	3	2	7	2	0	1	5	5	0	8	2
Word/number games	11	36	20	0	5	3	0	8	1	3	5	2	1	2	3	2	6	1	1	5	5	4	4	2
Learn science	20	26	22	2	5	1	3	5	2	2	5	3	2	2	2	4	2	3	1	3	7	4	3	3
Learn soc. studies	13	31	23	2	6	0	0	8	3	2	3	5	2	2	2	3	2	4	0	6	5	4	4	3
Practice spelling	30	16	21	5	0	3	6	5	0	7	2	1	1	0	5	7	2	0	0	1	10	2	6	2
Database/Spdsheet	39	15	13	8	0	0	6	2	3	3	4	3	3	0	3	3	2	4	8	3	0	5	4	0
Problem-solving	11	38	18	0	5	2	0	4	6	3	5	2	0	6	0	4	3	2	1	7	3	2	6	2
Textbook questions	40	16	11	6	2	0	11	0	0	8	1	1	5	0	1	4	4	1	1	5	5	3	3	4
Experiment or demo	21	37	9	5	3	0	0	6	5	0	8	2	0	6	0	5	3	1	4	6	0	5	4	2

Question 8: What has your class done with the computer so far this year?

Codes: All- overall frequencies
CL - computer lab
OC - one computer/classroom
TT - team teaching
IL - cai mini-lab
AL - application mini-lab
SC - self-contained
TN - take home (Buddy System)

Frequency Codes: N - not at all
S - some
O - often

Table 2

Student Question Sort x Usage
Question 8
second round

	All			CL			OC			TT			IL			AL			SC			TH		
	N	S	O	N	S	O	N	S	O	N	S	O	N	S	O	N	S	O	N	S	O	N	S	O
Practice math	15	37	14	0	3	5	1	9	1	6	4	0	3	5	2	2	5	1	2	2	4	3	9	1
Write	15	33	22	0	7	1	6	4	1	0	4	7	5	3	2	2	5	1	0	5	4	2	5	6
Type after writing	22	39	8	4	4	0	6	5	0	0	7	3	5	4	1	3	5	0	0	8	1	4	6	3
Keyboarding	17	32	19	0	4	4	5	6	0	0	6	4	5	4	1	4	3	0	0	2	7	3	7	3
Word/number games	10	41	19	0	4	4	0	10	1	5	5	1	2	5	3	1	5	2	0	6	3	2	6	5
Learn science	12	37	21	1	6	1	0	9	2	1	5	5	4	6	0	1	2	5	0	1	8	5	8	0
Learn soc. studies	12	34	23	2	4	2	0	10	1	0	2	9	0	7	2	1	4	3	1	3	5	8	4	1
Practice spelling	34	16	18	2	5	1	10	1	0	10	0	0	4	1	4	7	0	1	0	2	7	1	7	5
Database/Sprdsheet	30	25	15	5	3	0	6	4	1	3	4	4	7	1	2	0	5	3	6	3	0	3	5	5
Problem-solving	9	35	24	1	7	0	0	4	7	9	0	1	0	3	6	3	1	4	0	6	3	5	5	3
Textbook questions	38	23	7	4	4	0	11	0	0	9	1	0	7	2	0	5	2	1	0	4	5	2	10	1
Experiment or demo	15	39	16	1	7	0	1	2	8	0	9	2	6	4	0	2	5	1	2	5	2	3	7	3

Question 8: What has your class done with the computer so far this year?

Codes: All- overall frequencies
CL - computer lab
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SC - self-contained
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Frequency Codes: N - not at all
S - some
O - often

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Table 3

Teacher Question Sort x Usage
Question 13
first round

	All				CL				OC				TT				IL				AL				SC				TH			
	N	L	M	E	N	L	M	E	N	L	M	E	N	L	M	E	N	L	M	E	N	L	M	E	N	L	M	E	N	L	M	E
INSTRUCTIONAL USES																																
Drill & Practice	9	20	7	6	0	2	0	1	0	4	0	0	2	2	0	0	1	5	2	0	6	4	1	0	0	0	1	2	0	3	3	3
Teacher demo	1	21	13	7	0	3	0	0	0	0	2	2	0	1	1	2	1	4	2	1	0	5	4	2	0	2	1	0	0	6	3	0
Simulations	13	11	16	2	0	2	1	0	0	0	4	0	1	1	2	0	4	1	2	1	5	3	2	1	0	1	2	0	3	3	3	0
Thinking skills	5	9	17	9	0	0	2	1	0	1	0	3	0	1	2	1	1	1	4	2	3	3	4	1	0	1	2	0	1	2	3	3
Keyboarding	10	11	9	11	0	0	1	2	1	3	0	0	0	1	1	2	4	3	1	0	5	4	2	0	0	0	2	1	0	0	2	6
Programming	27	8	5	1	3	0	0	0	3	1	0	0	3	1	0	0	7	1	0	0	5	3	2	0	2	1	0	0	4	1	3	1
Student Wd. Proc.	8	1	13	20	0	0	2	1	2	1	1	0	1	0	1	2	4	0	1	3	0	0	7	4	0	0	0	3	1	0	1	7
Database/Sprdsht	1	2	0	3																				3	0	1	0	0	1	1	0	0
INSTRUCT. SUPPORT																																
Utility	11	9	10	11	1	1	1	0	0	1	2	1	2	0	1	0	4	2	1	1	1	2	3	5	1	0	0	2	2	3	2	2
Tchr. Wd. Proc.	0	6	13	22	0	0	0	2	0	1	3	0	0	0	3	1	0	2	3	3	0	2	3	6	0	0	0	3	0	1	1	7
Database/Sprdsht	16	9	8	8	2	0	0	0	1	1	2	0	1	1	1	1	6	0	1	1	2	2	2	5	0	1	1	1	4	4	1	0
Graphics Prod.	8	12	16	6	1	1	1	0	0	1	2	1	0	2	2	0	3	4	0	1	3	2	5	1	0	0	2	1	1	2	4	2
Desktop Pub.	27	7	6	1	2	0	1	0	1	1	2	0	2	1	0	0	7	1	0	0	8	2	1	0	0	0	2	1	7	2	0	0
On-line database	28	6	7	0	3	0	0	0	3	0	1	0	4	0	0	0	8	0	0	0	6	2	2	2	2	1	0	0	2	3	4	0

Question 13: To what extent are you using computers for the following educational purposes?

Codes: All- overall frequencies
CL - computer lab
OC - one computer/classroom
TT - team teaching
IL - cai mini-lab
AL - application mini-lab
SC - self-contained
TH - take home (Buddy System)

Frequency Codes: N - None
L - Little
M - Moderate

Table 4

Teacher Question Sort x Usage
Question 13
second round

	All	CL	OC	TT	IL	AL	SC	TH
	N L M E	N L M E	N L M E	N L M E	N L M E	N L M E	N L M E	N L M E
INSTRUCTIONAL USES								
Drill & Practice	5 21 7 4	0 2 0 1	0 4 0 0	3 0 0 0	1 3 2 0	1 9 1 0	0 0 1 0	0 3 3 3
Teacher demo	1 10 18 7	0 1 2 0	0 0 1 3	0 0 3 0	1 4 1 0	0 2 6 3	0 0 1 0	0 3 4 1
Simulations	17 17 9 8	0 1 2 0	0 0 3 1	0 0 1 2	5 0 0 1	0 7 1 1	0 0 0 1	0 4 2 2
Thinking skills	1 10 13 11	0 0 2 1	0 0 0 4	0 0 1 2	0 1 3 2	1 7 2 0	0 0 0 1	0 2 5 1
Keyboarding	6 12 10 8	0 0 2 1	1 3 0 0	0 0 0 3	0 4 2 0	5 4 2 0	0 0 0 1	0 1 5 2
Programming	19 7 3 2	2 1 0 0	3 1 0 0	3 0 0 0	0 4 0 0	5 2 2 1	1 0 0 0	5 0 1 1
Student Wd. Proc.	3 3 11 15	0 0 1 1	1 2 1 0	2 0 0 1	0 1 3 2	0 0 5 6	0 0 0 1	0 0 1 7
Database/Sprdsht	4 8 7 15	0 2 1 0	1 0 1 2	1 0 1 1	2 0 0 2	0 1 2 8	0 0 1 0	0 6 1 2
INSTRUCT. SUPPORT								
Utility	6 6 12 12	0 2 1 0	0 1 2 1	1 0 1 1	4 1 0 1	1 0 4 6	0 0 0 1	1 2 4 2
Tchr. Wd. Proc.	4 4 11 19	0 2 0 1	0 0 3 1	2 0 0 1	2 0 3 1	0 2 3 6	0 0 0 2	0 0 2 7
Database/Sprdsht	7 7 15 8	2 1 0 0	1 1 1 1	0 0 3 0	2 1 1 1	0 0 6 5	0 0 1 0	2 3 3 1
Graphics Prod.	5 8 17 7	0 1 2 0	1 0 3 0	2 0 1 0	1 3 1 1	1 2 5 3	0 0 0 1	0 2 5 2
Desktop Pub.	19 9 4 3	2 1 0 0	1 2 1 0	2 1 0 0	2 2 0 0	7 1 2 1	0 0 0 1	5 2 1 1
On-line database	20 10 2 1	3 0 0 0	2 1 0 0	0 1 0 0	3 2 0 0	6 4 1 0	0 1 0 0	6 1 1 1

Question 13: To what extent are you using computers for the following educational purposes?

Codes: All- overall frequencies
CL - computer lab
OC - one computer/classroom
TT - team teaching
IL - cai mini-lab
AL - application mini-lab
SC - self-contained
TH - take home (Buddy System)

Frequency Codes: N - None
L - Little
M - Moderate
E - Extensive

The response frequencies can be reviewed using the following possible comparisons:

(1) changes in overall use for a particular activity (e.g., "practicing math") from the first to the second round of visits:

(2) differences in frequency of use for specific purposes among usage categories:

(3) changes in frequency of use for any specific usage category from first to the second round of visits;

(4) differences between students and teachers in reporting computer uses.

The following results may be noted from examining the tables.

Changes in overall use from first to second round based on STUDENT responses (Tables 1-2).

The results may be considered by examining the response frequencies for the "often" category or by combining the "some" and "often" categories for a more generalized finding. By looking at the results using both procedures, it seems that the most common uses (according to students) were for practicing math, social studies, science spelling, word/number games, problem-solving and writing. By the second round of visits, problem-solving, writing, and keyboarding were cited more often than during the first round.

Changes in overall use from first to second round based on TEACHER responses (Tables 3-4).

In the case of teacher responses, the results may be considered by examining the response frequencies for the "extensive" category or by combining the "moderate" and "extensive" categories for a more generalized finding. Looking at the results using these procedures, it appears that the teachers reported using the computers most often for student word processing, thinking skills, keyboarding, and teacher demonstration. By the second round of visits, the most significant change was that the use of database and spreadsheet had become much more common.

Changes in frequency of use for specific usage categories from first to second round of visits according to STUDENT responses (Tables 1-2. The top four responses are presented except in cases of ties.)

Most Frequent Uses 1st Round by Usage Category (top 4)

CL	Word/Number Games Practice Math Problem Solving Write
OC	Practice Math Social Studies Experiment/Demo Problem Solving
TT	Experiment/Demo Keyboarding Science Social Studies
IL	Practice Math Write Problem Solving Experiment/Demo
AL	Practice Math Write Type after writing Word/Number Games
SC	Write Spelling Word/Number Games Keyboarding Textbook Questions
TH	Keyboarding Type after writing Practice Math Write

Most Frequent Uses 2nd Round by Usage Category (top 4)

CL	Practice Math Keyboarding Word/Number Games Write
OC	Problem Solving Word/Number Games Science Social Studies
TT	Experiment/Demo Science Type after writing Keyboarding
IL	Problem Solving Social Studies Word/Number Games Practice Math
AL	Database/Spreadsheet Science Social Studies Word/Number Games
SC	Science Keyboarding Spelling Textbook Questions
TH	Spelling Write Word/Number Games Textbook Questions

Changes in frequency of use for specific usage categories from first to second round of visits according to TEACHER responses (Tables 3-4. The top three responses are presented except in cases of ties. Responses are those related to instructional uses.)

	Most Frequent Uses 1st Round by Usage Category (top 3)	Most Frequent Uses 2nd Round by Usage Category (top 3)
CL	Thinking Skills Keyboarding Student Wd. Processing	Keyboarding Thinking Skills Demonstration Simulations
OC	Demonstration Simulations Thinking Skills	Thinking Skills Demonstration Simulations
TT	Demonstration Keyboarding Student Word Processing	Keyboarding Thinking Skills Simulations
IL	Thinking Skills Student Wd. Processing Demonstration	Thinking Skills Student Wd. Processing Database/Spreadsheet Drill and Practice
AL	Student Wd. Processing Demonstration Thinking Skills	Student Wd. Processing Database/Spreadsheet Demonstration
SC	Student Wd. Processing Drill and Practice Keyboarding	Simulation Thinking Skills Keyboarding
TH	Student Wd. Processing Keyboarding Thinking Skills	Student Wd. Processing Keyboarding Thinking Skills

Effects on Curricular Integration

The most difficult task for teachers to accomplish in this project has been the successful integration of computer use with the school's curriculum. Many of the teachers have had notable success in doing so, although in most cases, there might not have been integration with all subject areas; this was not a requirement of most of the usage categories in any case. The most successful integration occurred under three conditions:

1) sites that had Macintosh computers that demanded use of application software, rather than any packaged software related to various content areas;

2) sites in which the computers were rotated into the classrooms, and their presence demanded that the teachers find ways to integrate their use with their daily instruction;

3) one computer/classroom sites where the configuration and usage category description demanded that teachers find appropriate software for involving students in cooperative learning and problem-solving situations focused on content areas.

The following scenarios from site summaries were selected to represent the most effective examples of curricular integration--to illustrate what is possible with careful planning and creativity.

Scenario 1:

On the day of the site visit, the teacher provided an impressive demonstration in the lab using "First Choice", an integrated word processing, spreadsheet, and graphics software package... First, students accessed an existing file called "Census" out of the spreadsheet program. They had entered census data and switched to the graph program to obtain a visual image of the data. Looking at the graphs that were made, the teacher asked, "Between what years was there the biggest increase in population?" and "Between what years was there the least increase in population?" to assess the students' ability to understand graphs. She demonstrated how well the computer use has been integrated into the curriculum by then asking, "Can you think of any reason why that would be? Think about what was happening in the country at that time." One student responded that many people had died in the war, that the country was just getting started, etc. From that response, the teacher asked, "Have you ever heard of the term 'baby boomers'?" A few students responded that it was

a movie (and the teacher agreed). Another student responded that it was something that occurred in the 1950s.
The class discussed the term for a little while longer and decided that the "baby boom years" came when soldiers came home from the war, and a lot of children were born nine or ten months later. The project teacher then turned the discussion back to the graphs and asked, "What kind of graph do we have now? Let's change it to a trend graph." She then explained that a trend was a tendency or an estimation of where something is going. She asked the students, "What does trend show might be the average population for 1990?" One student said, "250 million or a little higher." She then began to teach about census studies and trends for population and other demographics using the computer. (TT)

Scenario 2:

The computer use observed was well-aligned with the text, as it served as the basis and one of the resources for the activity. Different groups will end up with different information on the subject, depending on the direction they choose to take. The teacher talked about children working to their capabilities, not being limited or lost by the usual lockstep instruction. With nine groups each working on their own stack, it was slightly chaotic in a good sort of way. Students were trying all kinds of Mac capabilities in making stacks. The teacher served as a facilitator of learning, not necessarily having all the answers. If it was a tough question, (the teacher) often solicited help from the entire class, and usually someone knew how to do it and would supply the needed assistance. (AL)

Scenario 3:

Three activities were observed during the visit. The first activity involved the entire class. They were studying Indiana government in social studies and were using software specific to Indiana government. One student sat at the computer, and another directed the class discussion and called on students for answers to follow-up multiple-choice questions. The teacher stayed in the background mostly, but did bring in some current-event discussion because of Parke County elections the week before and an anticipated visit to Indianapolis, the state Capitol, in a few days. Most of the students remained attentive. Their attention was directed toward a computer monitor which is quite small for full-class viewing. Apparently the teacher has access to an LCD projector, but chose not to use it. It was a worthwhile activity and a good group use of the software.

The second activity observed was students working in pairs on science software, "Chem Lab" by Simon & Schuster. Students perform experiments on the computer, combining chemicals to get the proper combination or reaction. There are worksheets that accompany the activities. The software contains 50 experiments, and students on this day were working on numbers 31 and 32. They do this quite a bit. Each of the three students interviewed named "Chem Lab" as his favorite activity. A teacher log on "Chem Lab" noted that children learn a lot and gave an example of a student explaining a particular chemical reaction to a visitor from another school.

The third activity occurred the last five minutes of the school day. The teacher assembled the class around a computer station and introduced a lesson from "Science Toolkit" that will be expanded on the next day. The experiment centers around using a thermometer probe hooked to the computer and measuring temperature changes from various chemical reactions. She introduced the terminology of "exothermic" and "endothermic" also. This was an excellent introductory lesson for the main lesson the next day. (SC)

Scenario 4:

One project which involved the computers extensively was an archaeological dig simulation. Students had a "dig" area outside, used the computer to make entries into their own daily log describing their dig experiences, made reports, etc. and ended up with a bound, finished book on the project.

These examples serve to reinforce the finding that many of the teachers were thoughtful and creative in planning computer use that was integrated with their curriculum. They also support the point that such meaningful integration is possible and exciting for students and teachers alike.

Computer Software

The following software was most commonly mentioned in each of the categories identified. In some cases, the identification may not be exactly accurate because it was sometimes difficult for the evaluator to determine the exact nature of a piece of software. They are listed to elucidate the variety and scope of software that was identified and used in this project.

Word Processing

Writing Assistant
Multi-Scribe
Fredwriter
Logowriter
Rebus Writer
PFS Write
Rabbit Writer
Primary Editor

Graphics

Print Shop
Laser Disk
Hyper Media Studio
Slide Shop
Video Eyes
Paintworks
Animate
Printing Press
Story Board Plus

Science

Sir Isaac Newton's Games
Cardiovascular Lab
Body in Focus
Incredible Laboratory
O'Dell Lake
Animal Trackers
Energy House
Science Toolkit

Social Studies

Oregon Trail
Where in the World/USA is Carmen Sandiego?
GEO World
Agent USA
Our Town
Foundations of State History

Problem Solving/Simulations

Jr. Jeopardy
Choices
Lemonade Stand
Hot Dog Stand
Gertrude's Secrets
Mystery Objects
Lighthouse
Miner's Cave
Ace Reporter
Teaser
Factory
Missing Links
Decisions, Decisions
Wood Car Rally
Think Quick
The Pond
Furs
Ant Farm
Iggy's Knees
Safari Search
Memory Building Blocks
Timeliners
Super Factory
National Inspirer

Math

Math Munchers
Challenge Math
Speedway Math
Math Blaster
Bombers
Turbo Math
Math Mansions
Magic Garden

Word Attack

Word Munchers
Compound Words

Databases

Our Town
Memory Castle
Minerals
Climate and Weather
Colonial Times
Jobs Activity

Integrated Software

First Choice
Appleworks
Microsoft Works

IV. SUMMARY AND RECOMMENDATIONS

The purpose of this study was to identify new teaching/learning strategies that can be facilitated by the use of technology and to specify factors and configurations that have impact on computer use in the classroom. This purpose was richly fulfilled. In this summary, two strategies for synthesizing the information will be used: 1) The reader's attention will be drawn to sites that the evaluators agreed were the most successful in each usage category. This will allow the reader to read in more depth the descriptions of sites in which the teachers and students worked within the framework of the usage category, overcoming whatever barriers might have presented themselves, to establish effective computer use in their classrooms. 2) Factors will be identified that the evaluators feel contributed significantly to the success of those sites listed under (1) above and also played an important role in many of the other sites.

Successful Sites

In each usage category, one site was identified by the evaluators as the one that enjoyed the largest margin of success. In some cases, the margin was quite substantial in that the identified site was "head and shoulders" above the others. This should not diminish the pockets of success noted in many of the other sites because, in fact, there were numerous examples of successful or noteworthy implementation. The reader should not conclude that the identified sites were the only ones that evidenced success. They are presented below by usage category with brief rationales for the selections.

Computer Lab: Harrison Elementary (South Bend)

This year the project teacher took a much greater role in setting the direction for the project than she did last year. She set personal and professional goals for both the project and the students. She became more involved in the review and selection of software that allowed integration into the curriculum, rather than selecting software that would drive the instruction. She has changed the way she teaches in that she is now much more willing to relinquish control and facilitate instruction, providing opportunities for students to take greater responsibility for their own learning.

One Computer/Classroom: Jefferson Elementary (Plymouth)

For a variety of reasons, the project really took off during the second year of implementation. The new principal has not only been extremely supportive of the project but has also been instrumental in causing a new wave of technology use in the school. Project students enjoyed their role as computer experts and have maintained their enthusiasm, while at the

same time admitting some frustration at not having greater access to multiple computers for use with the whole class. The project students have learned to work cooperatively, and they have learned to share and help others.

Team Teaching: Happy Hollow Elementary (West Lafayette)

Students were involved in a variety of activities that capitalized on the power of the computer. They used a considerable amount of problem-solving and simulation software, wrote a considerable amount, used integrated and desktop publishing software, and engaged in telecommunications more than any other site. The teachers have been quite successful in integrating computer use with the curriculum, and students have found the experience exciting and interesting. A large part of the credit for the success of this project must be given to the consultant who helped to set an important tone and direction for the project.

CAI Mini-Lab: Eastern Pulaski Elementary (Winamac)

The teachers in this site have maintained the "spirit" of this usage category by moving the computers on portable carts and integrating them with the curricular areas designated by the usage category description. While they scrambled last year to find adequate software, they have done much better this year at focusing on a few packages that have really met their needs. They feel that "Microsoft Works" is almost all they need, and they have done extensive work with database, spreadsheet, and word processing. They have also integrated use in science and social studies well. Their students work well together, usually in threes. The teachers and students in this site have accomplished a great deal with computer use and have maintained a high level of interest and enthusiasm. It appears that these teachers will continue to search for ways to integrate the computers meaningfully with instruction. Although they are somewhat ambivalent because of the difficulty of moving them, they do see that having the computers present in the classroom makes it more likely that they will integrate them with instruction.

Application Mini-Lab: Perry Central (Leopold)

This project has many exemplary components. Indeed, it could be identified, far and away, as the best site overall. Where most second-year projects were experimenting in limited ways with databases and spreadsheets, this project was synthesizing their use with reports, graphing, creating "Hypercard" stacks, and so forth. The students were engaged in projects that could be considered to be on the "cutting edge" of what education can become. With the full support of the principal, teachers adjusted schedules and curricular emphases to meet

their needs in implementing the project. They rotated the computers on a daily basis but allowed flexible scheduling if there were unexpected needs. Words used in the objectives for this usage category--enrichment, creativity, productivity, cooperative learning, problem solving--came alive in this project.

Self-Contained: Rockville Elementary

The teacher learned a great deal about using the computer flexibly for instruction and demonstration, the use of specific software, and successful ways of involving parents on an ongoing basis. The students used the computer to do a lot of writing and to explore with programs in science and social studies that they reported liking very much. The students have been involved in many projects, and the activities in which the students engaged on the computer were well integrated with daily instruction. The institution of "Child-Parent Nights" was one of the best examples of involving parents in computer implementation.

Buddy System: Indian Creek (Lawrence)
Blanche Fuqua (Terre Haute)

It was not possible to choose one of these sites over the other because of the dramatic differences in software/hardware configurations. It seemed to the evaluators that the two kinds of sites were equally successful--in different ways. The teachers have all found ways to integrate computer use with the curriculum, although it goes without saying that the fourth grade teachers who were involved with the project last year had a distinct advantage over the fifth grade teachers who were new to the project. Ironically, it was the fifth graders who had been in the project last year, so they easily outstripped their teachers in computer knowledge and facility. The teachers involved their students in numerous problem-solving and simulation activities that really increased their ability to take responsibility for their learning. They incorporated telecommunications in several ways. It should be noted, however, that the Buddy System project, in general, still suffers from a lack of coordination between computer activities at school and in the home. This is an objective of the Buddy System that will need a more concerted effort if it is to be realized.

Factors Affecting Implementation

The following factors are ones that the evaluators, teachers, or students in the project identified as ones that contributed to success or impeded progress in the various sites.

1. **Location/Time**

Although it seems to be obvious, it should be stated that having adequate space and a comfortable arrangement of computers in a lab or classroom has a significant impact on the use of computers. A few sites did not see the importance or were unable because of their own space limitations to establish a conducive arrangement.
It was also concluded that having one or more computers present in the classroom on a regular or rotating basis made a significant difference in terms of how well computer use was integrated with the curriculum and daily instruction. "Computer presence" made demands on the teacher to plan and orchestrate effective computer use.

With regard to time, "the more the better" is another obvious finding of the study. It is also obvious that if students are going to develop effective keyboarding skills (a factor identified by many teachers and students as a critical promoter or inhibitor of computer facility) that they need more time than can be arranged when time is limited by having only one computer or infrequent times for individual students to be at the keyboard. Time can be effectively enhanced by having students work in pairs or threes, but only if the activity involves all of the students in meaningful ways. (More than three students is not workable; two is preferable.) "The single computer concept would work most effectively," reported one evaluator, "if the teacher and class also had access to a school computer lab for perhaps one or two hours per week. This would allow for hands-on use which builds familiarity and confidence, would even out access (for all students), and would allow for more writing activities."

2. **Training/Support**

Teachers (and the evaluators) felt that more training and on-going support is really necessary to ensure effective computer use. While this was intended to be a "real-world" study--in that giving teachers new resources without extensive training would not be uncommon--it would make an enormous difference if teachers had something on the order of a week of hands-on training before beginning and regular intervention as they continued to explore. In this regard, in those sites where mutual support groups were possible (because more teachers were involved) or valued, there was much greater evidence of success. In the most successful site, Perry Central, teachers met faithfully every week for two years. Working collaboratively, having regular access to a mentor, or networking makes a tremendous difference

in how successful teachers are in using computers in meaningful and interesting ways.

In one report, it was stated, "Another area that should be addressed is the need for time. Teachers need more time to prepare and receive training before school starts, more time and help in reviewing all the software available, more time and the opportunity to network with each other, and more time for the effective integration of the computer into the classroom. Perhaps a day of released time per month to work on these concerns could be allowed. Perhaps those teachers who are being given released time and who are serving as role models in their schools could also be expected to spend some of that time working with their colleagues to more effectively implement the computer into the curriculum."

3. **Instruction**

What is commonly stated about what is needed in order to provide effective instruction is no less true here. First, teachers need a "vision" (unfortunately a word that has become a cliche when it is so important) of what they want to accomplish with the computer resource. Many of the teachers involved in this project constructed a vision for themselves based on initial input and on their own classroom explorations, and these teachers created exciting instruction with their students. Others never understood the value of this and used the computers as they would extra workbooks, or perhaps tape recorders. Using the information presented in the site summaries for this project, it would be possible for teachers or administrators to understand the importance of having a vision and how such a vision might be implemented.

Finding ways to meaningfully integrate computers with the curriculum, that is linking computers and curriculum, is also vital. This is not easy to accomplish, but with each successful application, more extensive connections become possible. In general, it seemed that the use of application software or problem-solving and simulation software made this linkage more feasible.

Finally, teachers definitely need to be flexible. They need to organize and plan instruction in different ways. They need to encourage cooperative learning techniques and acquire a degree of comfort in acting more as a facilitator of learning than a dispenser of information. They need to step back and allow their students to take greater responsibility for their own learning. At some times, this will mean that the classroom is noisier, teeming with activity and student involvement. With

consideration given to these factors, computers can, indeed must be, an essential learning tool for all classrooms.

APPENDIX A

Directions to Field Staff: Use the interview protocols developed for last year's study to guide your line of questioning with those involved. Use the following probes as core questions that must be asked with answers noted in writing. Since we are not doing fall surveys, it is essential that we all gather common information regarding certain issues.

INTERVIEW PROBES: Principal

1. How has computer use affected your school in terms of space, expenditures, or school climate?

2. Are there any specific problems that you have been aware of related to hardware, software, classroom management, etc.?

3. Can you give specific examples of changes in teachers or students with regard to attitudes or achievement as a result of the computer project?

4. Do you think the support/resources have been adequate for the management of this project? (explain)

5. What recommendations would you make to people in another school trying to decide whether to adopt a computer-assisted instructional program such as yours? What conditions should exist before attempting such a program?

INTERVIEW PROBES: Teacher

1. At this point, what would you identify as the two biggest benefits you received from being involved in the computer project?

2. What are the two biggest benefits your students received from being involved?

3. What changes have occurred in your teaching as a result of your involvement in the computer project?

4. Be sure to have the usage category description (appropriate for this year) with you. Review it with the teacher. W h i c h objective in the usage category do you feel your students accomplished most effectively?

   Which objective do you feel was most difficult to accomplish?

5. Review personal goals teacher had set for this year (per first site visit) in regard to the computer project. How much progress do you feel you have made with respect to those goals?

6. **Review goals set for students (per first site visit). How much progress do you feel has been made toward those goals?**

7. **In what ways have you used computers for instruction this year?**

8. **What organizational patterns (1/1, small group, whole class) have you used with computers in the classroom/lab? Which pattern seems to be the most effective?**

9. **What kinds of cooperative learning activities have students been in engaged in using the computers? (explain)**

10. **Can you give specific examples of attitudinal changes in students that you have observed as a result of increased computer use?**

11. **Can you give specific examples of the impact of computer use on your students' achievement, work habits, use of creativity, and/or problem-solving skills?**

12. How have you used computers for instruction in writing (not appropriate with some usage categories), and what effects have you noted? (Find out whether this has been composing or merely entering handwritten material on computer. If not composing, find out why.)

13. Have you used the modem on a regular basis? (If so...) how has it been used? (If not...) why not?

14. To what extent did you use the computers for the following educational purposes?

none	little	moderate	extensive	INSTRUCTIONAL USES
___	___	___	___	Computer-assisted drill and practice or tutorial
___	___	___	___	Teacher demonstration
___	___	___	___	Simulations
___	___	___	___	Thinking skills software (games of logic or problem-solving)
___	___	___	___	Keyboarding instruction
___	___	___	___	Programming instruction
___	___	___	___	Student word processing
___	___	___	___	Database/Spreadsheet
___	___	___	___	Other_____

none	little	moderate	extensive	INSTRUCTIONAL SUPPORT
___	___	___	___	Utility software (grade reports, tests, etc.)
___	___	___	___	Teacher word processing
___	___	___	___	Database/spreadsheet
___	___	___	___	Graphics production
___	___	___	___	Desktop publishing
___	___	___	___	On-line database searching
___	___	___	___	Other:_____

15. About how much time do individual students spend using a computer in the classroom/lab?

16. (Elicit as much detail on the following as possible.)
You have been involved in a research project with computers for the last year (or two years). That meant that you were constrained to use them in certain ways or for certain purposes. Since you have now learned a great deal about computers and how to use them in the classroom, could you now describe what would be an ideal set-up for the most effective use? (Get answers to as many of the following as possible. How many? Where? What hardware/software? What would you teach? What sequence? How best to integrate with instruction? Keyboarding instruction? How many students working at computers? How much/what kind of training for teachers?)

INTERVIEW PROBES: Students

Directions: Randomly select three students (different ones from fall visit) to interview. Since it is often difficult to elicit responses from children, use follow-up prompts or questions whenever feasible.

1. How much have you used the computer at school this year compared to last year?

   ___ not as much ___ a little more
   ___ about the same ___ a lot more

2. What computer activity have you learned that you like best?

3. How many stories have you written using the computer this year? (detail, if possible; find out if this means actually composing or just entering previously handwritten story)

4. What do you really want to learn or do on the computer that you have not done yet?

5. What makes using the computer for learning fun?

6. What is difficult about using the computer?

7. When using the computer, I usually work (___by myself; with ___ other students). I like it best when I work (___ by myself; ___ with other students) because

8. What has your class done with the computer this year?

not at all	some	often	
___	___	___	Practice math problems
___	___	___	Write stories/reports
___	___	___	Type a story after hand-writing a draft
___	___	___	Learn to type without looking at keyboard
___	___	___	Play word or number games
___	___	___	Learn science/health lessons
___	___	___	Learn social studies lessons
___	___	___	Practice spelling words
___	___	___	Database/spreadsheet
___	___	___	Problem-solving games or simulations
___	___	___	Write answers to textbook questions
___	___	___	Other subject area activity
___	___	___	Experiment or demonstration

9. What is the one thing that you have learned to do on the computer that you are most proud of? Can you tell me about it?

10. Pretend you are the teacher and that you are in charge of setting up a new computer program in your classroom. What would you do? (**Possible follow-up probes:** How would you get started? What would you teach students first, second...? What kinds of things would you have students do? How would you arrange them in classroom?)

May 2, 1990

Mr. Robert E. Thomas
Fuqua Elementary School
1111 Wheeler Avenue
Terre Haute, IN. 47802

Dear Mr. Thomas:

As we did last year as part of the evaluation of the Fourth Grade Computer Project sponsored by the Indiana Department of Education, we are collecting standardized test data. While we know that such results do not provide the only answers to the question of effectiveness, we are trying to find out if there are even subtle changes. Last year we did find a small but significant change in test results.

This year test scores on the fourth grade students who are in the computer-assisted project classes will be compared to the same students' scores from last year. The data for these students from last year will, therefore, be third grade data. It will be necessary to identify each student's score from last year and this year, so we will need names or I.D. numbers. (We realize that pre/post data will not be available for those students who are new this year or who left the school this year.)

Our information needs, then, are as follows:

> CAT scores for total reading, total mathematics, and total battery reported in NCEs if possible;

> spring 1989 scores for third grade students who are current fourth graders in computer project classes this year;

> spring 1990 scores for the same students now participating in the fourth grade computer project classes.

Please sumbit the information by May 31, 1990, if possible. If you have Class Record Sheets which McGraw-Hill provided to you, simply making copies of these for all third grade classes last year and the participating fourth grade class(es) this year will suffice. (We will need to have the lists for all of the third grades, since we will have to find the participating fourth grade students to match.) If you do not have these available, a form is enclosed which, when completed, will give us all the information we need. (Make as many copies as necessary.) You will notice that the

enclosed form provides us with matched data, thus making it easier to analyze, but either method of responding will provide us with the necessary scores. We appreciate your help and the time it will take to gather the information, so however you choose to do it will be fine.

In our analyses, we will be using students' individual scores. It is important, therefore, that we have individual student scores. We guarantee the confidentiality of the records with which you provide us. If you are more comfortable in complying with our request by substituting I.D. numbers for student names, you may do so. HOWEVER, it will be necessary to assign identical student numbers to the same student for last year and this year.

If you have any questions about this request or if you do not use the CAT as your standardized measure of achievement, please contact me at (800)456-2380 or (317)244-8160.

Thank you for your help. It is essential that we have this information in order to complete our evaluation of the project.

Sincerely,

Beverly P. Farr, Ph.D.
Project Manager

Encl: Reporting form
Return envelope

CAT TEST DATA REPORT FOR FOURTH GRADE STUDENTS IN COMPUTER PROJECT

Directions: Report by fourth grade classroom and teacher. Preprinted "Class Record Sheets" or other methods of reporting required data is acceptable. Please return in stamped, addressed envelope enclosed to Advanced Technology by May 31, 1990. Thank you.

(Test Data reported in NCEs ___ Other _____)

Fourth Grade Teacher: _____

School: _____

	Fourth Grade Scores (1990)			Third Grade Scores (1989)		
Name of Fourth Grader in Project	Math	Rdg.	Total	Math	Rdg.	Total

Fourth Grade Computer Project Log

Teacher: _____

School: _____

Date: _____ Effect on: Student learning ____
work habits ____
attitudes ____
problem solving ____
Teacher attitude ____
instruction ____
____

Date: _____ Effect on: Student learning ____
work habits ____
attitudes ____
problem solving ____
Teacher attitude ____
instruction ____

Notes: ____

APPENDIX B

Model Applications
Usage Category: CAI Mini-lab -- 1989-90

Objectives:

* To use the computer as a tool for enrichment, creativity and productivity in math, social studies, and science.
* To improve teacher effectiveness through the use of utility software.
* To promote cooperative learning.
* To use individually-paced learning activities.
* To enhance problem solving and higher order thinking skills.

Key Elements:

1. A mini-lab consists of seven or eight units moving together from classroom to classroom.
2. Each classroom will have the use of the mini-lab for one fourth of the school time.
3. Teachers will be provided with a two work units that can be used at school or at home. Teachers will use application and utility software such as word processing, grade management data base, etc.
4. Teachers and students will use CAI software to enhance the targeted subject areas.
5. Students will use application software (as opposed to drill and practice) to explore production of maps, graphs, charts, model building, data bases, etc.
6. Teachers will use a variety of presentation modes: individual, small and large groups.

Eligible Applicants:

One elementary school having four fourth grades or a combination of two fourth and two fifth grades.

Training and Support:

Cooperative learning and telecommunications.

Resources:

Ten computer units (two for teacher work units) sharing two printers, mobile furniture.

Applications, simulation, and problem solving software integrated with the targeted curriculum areas.

Supplies such as disks, printer paper.

Modem, telecommunications software, and a telephone line.

NOTE: The Department of Education is operating a telecommunications bulletin board called IDEAnet. it contains a Fourth Grade conference where you all can share ideas and concerns. You will also be receining important information about this project on IDEAnet.

BUDGET:

Funding for this site is $10,000.00 which may be used in the following ways:

Equipment: Computers and printers have been provided for this study and should not be included in the budget. The computers provided include two computers for teacher use at home or at school. One or two additional computers for teachers could be purchased this year, but those computers MAY NOT be added to the mini-lab. These mini-labs were designed to test a 4:1 student to computer configuration, and that ratio is still part of the study. The equipment budget may include one large screen monitor or projection system, portable furniture, a modem, and other equipment to support this project.

Software: Software must be compatible with the goals of the program and purchased in quantities to comply with copyright laws.

Stipends and travel expenses not to exceed $4,000.00. Stipend funds are not transferable to other line items.

Telecommunications charges and telephone charges.

Other expenses may include supplies, installation of telephone line, wiring, etc.

No matching funds are required of the local corporation. The corporation may contribute funding to the project in any way that does not disturb the goals of the computer lab guidelines. Equipment already owned by the corporation may be used in this project if that allocation of resources does not detract from existing instructional programs.

Model Applications
Usage Category: One Computer/Classroom -- 1989-90

Objectives:

* To motivate students to actively explore math, science and social studies concepts.
* To enhance problem solving and higher level thinking skills.
* To encourage the use of a variety of presentation modes: individual, small and large group.
* To promote cooperative learning.

Key Elements:

1. One computer in a fourth grade classroom.
2. Students have access to computer throughout the day, but do not use a computer lab.
3. Teacher presents software to students in a large group at least once a week and follows with a student managed schedule of individual or small group activities.
4. Subject area emphasis: math, science, social studies.
5. Applications, simulation and problem solving software used as opposed to drill and practice.

Eligible Applicants:

Fourth grade self-contained classrooms (i.e. not departmentalized) which have no access to a lab.

Training and Support:

Cooperative learning and telecommunications.

Resources:

Computers - one for the classroom and one as a teacher work unit which may be used at school or at home, large screen monitor or overhead projection system, and a printer.

Software for math, science, and social studies which emphasizes higher order thinking skills, problem solving, simulations, and applications such as word processing and data base.

Supplies such as disks, printer paper.

Modem, telecommunications software, a telephone line.

NOTE: The Department of Education is operating a telecommunications bulletin board called IDEAnet. It contains a Fourth Grade conference where you all can share ideas and concerns. You will also be receiving important information about this project on IDEAnet.

BUDGET:

Funding for this site is $7,000.00 which may be used in the following ways:

Equipment: The equipment budget may include one large screen monitor or projection system, modem, and other equipment to support this project.

Software: Software must be compatible with the goals of the program and purchased in quantities to comply with copyright laws.

Stipends and travel expenses not to exceed $1,000.00. Stipend funds are not transferable to other line items.

Telecommunications charges and telephone charges.

Other expenses may include supplies, installation of telephone line, wiring, etc.

No matching funds are required of the local corporation. The corporation may contribute funding to the project in any way that does not disturb the goals of the one computer per classroom guidelines.

Model Applications
Usage Category: Application Mini-lab -- 1989-90

Objectives:

* To use the computer as a tool for enrichment, creativity and productivity in math, social studies and science.
* To improve teacher effectiveness through the use of utility software.
* To promote cooperative learning.
* To use individually-paced learning activities.
* To enhance problem solving and higher order thinking skills.

Key Elements:

1. A mini-lab consists of seven or eight units moving together from classroom to classroom.
2. Each classroom will have the use of the mini-lab for a minimum of one fourth of the school time.
3. Teachers will be provided with a two work units that can be used at school or at home. Teachers will use application and utility software such as word processing, grade management data base, etc.
4. Teachers and students may use hypermedia to design presentations in the targeted subject areas.
5. Students will use application software (as opposed to drill and practice) to explore production of maps, graphs, charts, model building, data bases, etc.
6. Teachers will use a variety of presentation modes: individual, small and large groups.

Eligible Applicants:

One elementary school having four fourth grades or a combination of two fourth and two fifth grades.

Training and Support:

Cooperative learning and telecommunications.

Resources:

Nine or ten computer units with built-in hard drives (two for teacher work units), two printers shared among all student work stations, and mobile furniture.

Software of the hypermedia type, integrated applications (word processing, data base, spread sheet), and graphics.

Supplies such as disks, printer paper.

Modem, telecommunications software, and a telephone line.

Model Applications
Usage Category: Team Teaching -- 1989-90

Objectives:

* To assist the student in planning for individualized learning tasks in science, social studies, and writing.
* To coordinate lab software with science and social studies curriculum.
* To improve teacher effectiveness through use of utility software.
* To provide instruction and practice in keyboarding followed by word processing and process writing.
* To implement special classroom techniques to compliment a 4:1 student to computer ratio.

Key Elements:

1. 4:1 ratio of students to computers (2:1 ratio at the time students are using the computers). Computers will be located in one classroom, with teachers team teaching and students and/or teachers changing rooms.

2. Software that is carefully chosen to support a 4:1 ratio:
   A. having management and record keeping features,
   B. accommodating small group and large group activities as well as individual activities (keyboarding and word processing are examples of activities best done individually).
3. Highly structured classroom management:
   A. students rotating for three subjects,
   B. each student having 15 minutes for individual keyboarding each day during the first six weeks of school,
   C. maximum individualization of instruction within a cooperative learning setting.

Eligible Applicants:

One elementary school having two fourth grades with teachers willing to team teach.

Training and Support:

Cooperative learning, process writing, telecommunications, and other topics as needed.

Resources:

Fifteen or sixteen computer units (two for teacher work units) sharing four printers.

NOTE: The Department of Education is operating a telecommunications bulletin board called IDEAnet. It contains a Fourth Grade conference where you all can share ideas and concerns. You will also be receiving important information about this proect on IDEAnet.

BUDGET:

Funding for this site is $10,000.00 which may be used in the following ways:

Equipment: Computers and printers have been provided for this study and should not be included in the budget. The computers provided included two computers for teacher use at home or at school. One or two additional computers for teachers could be purchased this year, but those computers MAY NOT be added to the mini-lab. These mini-labs were designed to test a 4:1 student to computer configuration, and that ratio is still a part of that study. The equipment budget may include one large screen monitor or projection system, portable furniture, a modem, and other equipment to support this project.

Software: the software must be compatable with the goals of the program and purchased in quantities to comply with copyright laws.

Stipends and travel expenses not to exceed $4,000.00. Stipend funds are not transferable to other line items.

Telecommunications charges and telephone charges.

Other expenses may include supplies, installation of telephone line, wiring, etc.

No matching funds are required of the local corporation. The corporation may contribute funding to the project in any way that does not disturb the goals of these guidelines. Equipment already owned by the corporation may be used in this project if that allocation of resources does not detract from existing instructional programs.

Model Applications
Usage Category: Team Teaching -- 1989-90

Objectives:

* To assist the student in planning for individualized learning tasks in science, social studies, and writing.
* To coordinate lab software with science and social studies curriculum.
* To improve teacher effectiveness through use of utility software.
* To provide instruction and practice in keyboarding followed by word processing and process writing.
* To implement special classroom techniques to compliment a 4:1 student to computer ratio.

Key Elements:

1. 4:1 ratio of students to computers (2:1 ratio at the time students are using the computers). Computers will be located in one classroom, with teachers team teaching and students and/or teachers changing rooms.

2. Software that is carefully chosen to support a 4:1 ratio:
   A. having management and record keeping features,
   B. accommodating small group and large group activities as well as individual activities (keyboarding and word processing are examples of activities best done individually).
3. Highly structured classroom management:
   A. students rotating for three subjects,
   B. each student having 15 minutes for individual keyboarding each day during the first six weeks of school,
   C. maximum individualization of instruction within a cooperative learning setting.

Eligible Applicants:

One elementary school having two fourth grades with teachers willing to team teach.

Training and Support:

Cooperative learning, process writing, telecommunications, and other topics as needed.

Resources:

Fifteen or sixteen computer units (two for teacher work units) sharing four printers.

Applications, simulation, and problem solving software integrated with the targeted curriculum areas.

Supplies such as disks, printer paper.

Modem, telecommunications software, a telephone line.

NOTE: The Department of Education is operating a telecommunications bulletin board called IDEAnet. It contains a Fourth Grade conference where you all can share ideas and concerns. You will also be receiving important information about this project on IDEAnet.

BUDGET:

Funding for this site is $9,000.00 which may be used in the following ways:

Equipment: Computers, and printers have been provided for this study and should not be included in the budget. The computers provided include two computers for teacher use at home or at school. The equipment budget may include one large screen monitor or projection system, portable furniture, a modem, and other equipment to support this project.

Software: Software must be compatible with the goals of this program and purchased in quantities to comply with copyright laws.

Stipends and travel expenses not to exceed $2,000.00. Stipend funds are not transferable to other line items.

Telecommunications charges and telephone charges.

Other expenses may include supplies, installation of telephone line, wiring, etc.

No matching funds are required of the local corporation. The corporation may contribute funding to the project in any way that does not disturb the goals of the team teaching guidelines. Equipment already owned by the corporation may be used in this project if that allocation of resources does not detract from existing instructional programs.

Model Applications
Usage Category: Computer Lab -- 1989-90

Objectives:

* To assist the student in planning individualized learning tasks.
* To coordinate lab software with science and social studies curriculum.
* To improve teacher effectiveness through use of utility software.
* To improve keyboarding, word processing, and process writing skills.

Key Elements:

1. Computer lab to support 2:1 student to computer ratio at the time students are using the lab.
2. Each student will have 15 minutes per day to complete keyboarding unit during initial training stages.
2. Students will use lab for a minimum of 30 minutes per day or 150 total minutes per week.
3. Students will use a variety of software that correlates with and enhances science, social studies, and writing curriculum.
4. Teachers will use application and utility software such as: word processing, grade management, data base, etc.
5. Keyboarding unit should precede word processing and process writing.

Eligible Applicants:

Schools with computer lab for 2:1 student to computer ratio at the time students are using the lab.
Printers must be available.

Training and Support:

Cooperative learning, telecommunications, and process writing.

Resources:

Computer lab (currently in place) and scheduling which allows necessary lab time for experimental group.
One computer for use as a teacher work unit which may be used at school or at home.
Large screen monitor or overhead projection system, and printers.

Software for science, social studies, keyboarding, and word processing which emphasizes simulations, problem solving, and applications rather than drill and practice.

Supplies such as disks, printer paper.

Modem, telecommunications software, telephone line.

NOTE: The Department of Education is operating a telecommunications bulletin board called IDEAnet. It contains a Fourth Grade conference where you all can share ideas and concerns. You will also be receiving important information about this project on IDEAnet.

BUDGET:

Funding for this site is $8,000.00 which may be used in the following ways:

Equipment: One large screen monitor or projection system, modem, and other equipment to support this project.

Software: Software must be compatible with the goals of the program and purchased in quantities to comply with copyright laws.

Stipends and travel expenses not to exceed $1,000.00. Stipend funds are not transferable to other line items.

Telecommunications charges and telephone charges.

Other expenses may include supplies, installation of telephone line, wiring, etc.

No matching funds are required of the local corporation. The corporation may contribute funding to the project in any way that does not disturb the goals of the computer lab guidelines. Equipment already owned by the corporation is to be used in this project, but that allocation of resources should not detract from existing instructional programs.

Model Applications
Usage Category: Self-Contained -- 1989-90

Objectives:

* To assist the student in planning individualized learning tasks.
* To use the computer as a tool for enrichment, creativity, and productivity.
* To provide instruction and practice in keyboarding, followed by word processing and process writing.
* To encourage parent involvement.
* To promote cooperative learning.
* To enhance problem solving and higher order thinking skills.

Key Elements:

1. 2:1 ratio of students to computers.
2. Computers are integrated into all subject areas. This is accomplished, in most cases, in one of the following ways:
   A. Students are divided into two groups with one group using the computers while the other group is involved in instruction, discussion, or other activity. The two groups then switch places.
   B. Students use computers both individually and in pairs or in small groups. Science and Indiana History are taught to the entire group with students working in pairs at the computers following instruction and discussion. Students work individually in other subject areas.
3. Students will use computers fifty percent of the time allotted per subject in the State Curriculum guidelines.
4. Students will each spend 15 minutes a day on keyboarding during the first six weeks of school.
5. Application, simulation, and problem solving software will provide enrichment and encourage creativity.
6. Parent involvement may be encouraged in one of the following ways:
   A. Parent volunteers help with computers in the classroom.
   B. Parents attend homework night to use computers with their children.
   C. Parents visit the classroom and use computers with their children.

Eligible Applicants:

The three self-contained sites already participating in the study.

Training and Support:

Cooperative learning and telecommunications.

Resources:

Modem, telecommunications software, telephone line.

Subscription to a telecommunications service (optional).

NOTE: The Department of Education is operating a telecommunications bulletin board called IDEAnet. It contains a Fourth Grade conference where you all can share ideas and concerns. You will also be receiving important information about this project on IDEAnet.

Funding:

Funding for this site is $2,000.00 which may be used for instructional supplies and teacher stipends.

Advanced Technology Inc
Suite 200A
2601 Fortune Circle East
Indianapolis IN 46241
317 244 8160

EMHARTATI

March 12, 1990

Mr. Evan Berkey
Oak Hill Elementary
Oakley Avenue
Lowell, Indiana 46256

Dear Mr. Berkey:

Recently a member of our staff visited your school for the purpose of discussing the Fourth Grade Computer Project. Thank you for your cooperation in making these easy and enjoyable visits.

Our experience in conducting the evaluation of the project over two years has demonstrated that individuals associated with the project sometimes have difficulty specifying the results of the project. This is especially true when we ask specific questions in an interview or on a survey. For example, when we ask about the impact on student achievement, attitudes, or work habits, teachers often feel that it has had a positive impact, but they have difficulty giving specific evidence about that. Much of the rich and important detail about things that happen (or don't happen) is lost in the busy-ness of the school day.

Accordingly, I am enclosing multiple copies of a log sheet on which space is provided to make notes about things that happen in the computer project that reflect results in three areas:

1. Effects on student achievement, work habits, and problem-solving abilities;

2. Effects on student attitudes;

3. Effects on teaching strategies (both computer and non-computer.)

We would appreciate it very much if you would distribute these to all teachers in the project and ask them to keep them close at hand for making notes about things that happen in the computer project. (These may be either positive or negative examples.) This will help us tremendously in documenting the effects of the project and in making recommendations about its continuation.

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We will collect these logs when we make our visits at the end of the school year. I know it is not always convenient to maintain anecdotal logs, and your efforts in this regard will be very much appreciated.

Sincerely,

Beverly L. Farr, Ph.D.
Project Manager

APPENDIX C

CAI Site Assignments

Site Type	Beverly	Lou	Jean	Anna	Sheila	Rick/Darryl
Computer Lab		Spencer-Owen		IPS - #18	South Bend	
One/Class		Speedway	Flat-Rock Hawcreek Scott Co.		Plymouth	
Team/Tchng		Duneland			W. Lafayette Batesville	
CAI Mini-Lab	Eastern Pulaski	Salem			Wayne Township	
Apple Mini-Lab	Westfield	Perry - Central			Manchester	
Self Contained	East Allen	Tri-Creek Rockville				
Take Home		Vigo Co.		Lawrence Township	IPS - #14	
Videodisc						Center Grove

VOLUME II

Site Summaries

Computer Labs

Site:	Harrison Elementary (South Bend)
Usage Category:	Computer Lab
Site Visit:	Winter/Spring
Field Staff:	Sheila Short

INTRODUCTION

Harrison Elementary School of South Bend serves nearly one thousand students, Kindergarten through sixth and is the fourth largest elementary school in the district. The fourth grade project did not introduce computers to students at Harrison. For the last four years, every classroom has had a computer, and each grade level shares a printer. According to the principal, all staff are computer literate and are encouraged to use the computer as an instructional tool.

Harrison Elementary School in South Bend School Corporation first implemented the fourth grade computer project in the 1989 school year. The computer lab that existed at that time at Harrison was the site for the project with 31 Apple IIe computers and four printers, and it was staffed by two instructional assistants. The first year the project was implemented largely through the efforts of Harrison's media specialist with support from the principal, the project teacher, and the corporation. The media specialist holds a master's degree in educational computing and technology. She has served as a resource for the lab and provided instruction on how to use new software with both teachers and students. South Bend holds a corporation membership to MECC, so it has been relatively easy for the media specialist to take full advantage of the unlimited copyright privileges and has secured and reviewed a tremendous amount of MECC software, especially last year. The corporation also employs a curriculum facilitator who is primarily responsible for helping staff integrate technology into the curriculum .

The objectives guiding the project this year are listed below:

- to allow the teacher to assist the student in planning individualized learning tasks;
- to coordinate lab software with science and social studies curricula;
- to improve teacher effectiveness through use of utility software;
- to improve keyboarding, word processing, and process writing skills.

The computer lab project at Harrison was implemented this year with few problems. Because Harrison is a school that supports an

academic environment conducive to computer usage, the project has been managed well by the project teacher with strong support from the principal. This year the project teacher has taken a much greater role in setting the direction for the project than she did last year. She has set personal and professional goals for both the project and students. She has become more involved in the review and selection of software that will allow integration into the curriculum, rather than select software that will drive the instruction. She has also seen changes in the way that she teaches and is now much more willing to relinquish control of instruction and facilitate the activity than she was at the beginning of the project. Providing opportunities for students to take greater responsibility for their own learning on the computer is a new area of development for her. However, as a result, she believes that her students are learning problem-solving skills and are understanding the advantages of working cooperatively with one another.

FINDINGS

Teacher:

The project teacher was involved in the fourth grade computer lab project at Harrison last year. She indicated during the winter site visit that the two biggest benefits that she received from her involvement were the following:

- watching the kids grow and learn, seeing the light of discovery when the students experience moments of learning and getting students excited about their own learning;
- learning to facilitate the instructional process rather than direct and control it and seeing students take greater responsibility for their own learning.

She saw students benefitting from the project in two major ways. Students are now taking more responsibility for their own learning and are working at their own pace instead of the pace being set and monitored by her. In addition, she sees the lower-achieving student being able to accomplish more because of the computer.

When asked to describe the most non-computer change in teaching that had occurred as a result of involvement in the project, the teacher indicated that she is no longer so quick to provide the right answer. She now encourages students to try to figure out solutions and help one another.

The personal goals that the project teacher set for herself this year involved: (1) taking full advantage of the computer project by learning as much as she could; and (2) helping the

students to feel comfortable with all types of technology. The teacher felt that the students needed to be given the tools to go on after this project year had ended, and she wanted them to be able to apply and expand what they had learned in the fourth grade project. In regard to the first goal, the teacher indicated that last year there were too many channels to cross, with the District Coordinator and Harrison's Media Specialist also being involved in the implementation of the project, to accomplish some of the things that she wanted to do with the project. She feels that this year it's much better. She indicated that the principal is very progressive and very supportive of what she wants to do.

The computer is being used quite a bit in math (not a project subject area) because they have so much good math software (from MECC), in social studies, and word processing. At the time of the first visit, not much in the way of instruction in science had occurred as yet. She indicated that depending on the activity and subject area, the student to computer ratio is typically 1:1 or 2:1.

When asked to give specific examples of attitudinal changes that have been observed in students, the teacher indicated that other teachers commented that some things seemed to have really "come together for their kids" as a result of their involvement with the lab. Sometimes the students who wouldn't do drill and practice worksheets seem to get turned on to the computer starting at that level. They begin to see that even the boring work can be fun, and then they are ready to try other things. She thinks that they begin to see the computer as a valuable learning tool rather than a toy on which to play games.

In response to the question regarding using computers for instruction in writing, the teacher indicated that the students are instructed to begin their stories and reports, at least in outline form, before they come into the lab. She feels that students have learned to develop and organize their own thoughts in order to add some structure to the process.

Students:

During the winter and spring visits, all students interviewed indicated that they are using the computer a lot more this year than last year. Two students reported that they did not like keyboarding because it was boring but enjoyed "Oregon Trail," "Carmen San Diego," "Word Munchers," and "Number Munchers" as favorite computer activities. While one student couldn't think of any stories he had written this year, the other two talked about Christmas stories that they had written that they both enjoyed. All students mentioned learning to draw using the computer when asked what they would like to learn to do on the computer that they had not done yet this year. When asked what makes using the

computer for learning fun, students responded "when you make a mistake you can try again or go on to something else," and "it's not boring like just reading and answering questions." Students again mentioned keyboarding and learning the different functions of the keys as being boring and somewhat difficult activities when asked what was hard about using the computer. Although students responded that they usually worked by themselves at the computers when they worked on instructional activities, they all preferred working with other students mainly because it is "more fun and more is accomplished when there are others working with you."

SUMMARY

In general, project students seemed very comfortable talking about and working on computers. In a setting such as the computer lab at Harrison, where the academic atmosphere is quite conducive to computer usage, the project has been implemented and managed with no major difficulties. For the last four years, every classroom has had a computer, and each grade level shares a printer in addition to the computer lab which is used in adherence to a daily schedule. Teachers use the lab to teach reading, problem solving, science, social studies, geography, and other subjects. With a computer in every classroom and access to a wide variety of software, teachers have been encouraged by the principal and at the corporation level to view the computer as an instructional resource.

The biggest, most notable change in the project from last year to this year is the more active role that the project teacher has taken. She is no longer dependent on Harrison's media specialist, the curriculum facilitator employed by the corporation, nor the building principal to make decisions regarding the project and has taken a far more active role in the decision making this year than previously.

Site: IPS #18
Usage Category: Computer Lab
Site Visit: December, 1989
Field Staff: Anna Weiser

INTRODUCTION

This program has 16 Apple IIGS computers in a laboratory setting arranged around the walls of the room, with a teacher station in the center. Although there are 18 students in the class, there usually is someone absent, so most of the work on the computer is 1:1. Students work thirty minutes every day for a class period; sometimes they have an extra day a week if no one else has signed up to use the lab.

The lab site and number of computers were the same as last year. However, several other things are different this year. The class is smaller, so that while it was necessary to use the computers cooperatively last year, this year it is not necessary. More teachers in the building are using the lab, so the project teacher is unable to use it as frequently as before. There was much emphasis on using the computer to complete textbook assignments last year; there seems to be less emphasis on that this year as well as increased amounts of story writing using "Rebus Writer". The teacher has also increased the amount of science software in use. This teacher feels much more confident about what she is doing with the students in comparison to last year.

FINDINGS

Observation:

Students worked on two MECC disks during the site visit--"Mystery Objects" and "Word Munchers". With the first one, after getting the directions, they completed a practice session and then raced to see who would get done first. One child, who had difficulty understanding the directions, quit. Half the class enjoyed this procedure; the other half didn't like it, especially those who were not as quick. With "Word Munchers," children were working on short vowel sounds. Some completed this quickly. One child who couldn't read well (or perhaps hear the sounds), had real difficulty. After five minutes, some students were playing at random, rather than looking for the correct clue relationship. Again, children who were successful enjoyed this game, while those who were less successful, didn't like it.

During the observation in the lab, the programs did not seem to be very effectively used with all students. There wasn't any discussion of how this related to any of the work they were doing

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in the classroom. There was no adjustment for the individual ability of students to complete the assigned task.

Teacher:

One of the most important changes this year is the teacher's increased self confidence. Although there are areas where she still feels a need for training, she has maintained her enthusiasm and the utilization of the computer in a variety of ways.

The teacher felt that the easiest objectives of this usage category for her to accomplish will be improving keyboarding, and coordinating software with science and social studies, as well as her ability to use the utility software. The most difficult one will be individualization, as was evident during the lab observation. She apparently does not know how to adapt the materials for individual students. She had no additional training as of the visit, nor was she involved in networking. While she has gained in confidence, she is still unsure of how effectively she is in integrating the software into her classroom and expressed a desire to have someone come and observe for a longer time in order to give her advice on that.

Word processing was taught at the beginning of school. Children also preferred to practice their language assignments on the computer, so this was used as a means to improve keyboarding skills. The teacher has used "PAWS," "Rebus Writer," and "PSF Write" with the children and has encouraged their story writing. The class has also used the science software, "O'Dell Lake" and "Animal Trackers," a program on simple machines, and "Energy House," a program to help save energy by doing such things as turning off lights. For social studies, they have done "Oregon Trail". One day a week, they have math skills reinforcement practice in order to be able to use the games on some programs more effectively. The teacher reported that they are learning their number facts much faster on the computer than when she used to require the children to practice them at home or on flashcards. Students have not engaged in much cooperative learning this year, yet, although that is a goal for later in the year.

There has been a little use of the computer for drill and practice, for teacher demonstration and for simulations. Moderate use has occurred with thinking skills software and keyboarding instruction. Extensive use has been in the area of student word processing. There has been no programming instruction.

Use of the computer for instructional support has varied. The teacher has not used the database/spreadsheet, on-line database searching or utility software yet. There has been moderate use of graphics production (Printshop) and desktop publishing of student stories. She has used the computer to some extent for her own word processing.

The teacher indicated that a personal goal for herself will be using the utility software. For her students, she wants them to write more stories, become more proficient at word processing, and do more programs in social studies and science.

Students:

Students have liked using the computer from the very beginning. The teacher created positive expectations, and some were already beginning users or were primed by last year's class for it to be an exciting experience. It is still seen as a novelty. While it is too soon to see specific examples of its impact on student achievement, the teacher notes that their stories are getting longer. Because the screen looks more like a book page, children edit and seem to remember writing rules like indenting more easily. She thought their thinking skills were getting better.

The children were enthusiastic about learning to use the computer, in particular the word processing. They thought learning to type, and learning about things they had never done before were fun, as well as being able to do some of their assignments on it. Students indicated they liked best working by themselves. One child said, "The best thing about working on the computer is that you could be mad at it and it won't do anything back. You just tell the teacher."

Students reported writing four or five stories already this year. One said he enjoyed writing on the computer much better than on paper because his fingers didn't get tired and he could erase faster.

The items done most frequently so far included practicing math problems, writing stories, problem solving games like "Lighthouse" and "Oregon Trail," and "Math Munchers". Other activities included playing word or number games, learning social studies lessons, and writing answers to textbook questions in English. The did not report using word processing but did indicate that they had learned to type without looking at the keyboard.

The students were interested in doing the same things on the computer that their teacher had demonstrated. One wanted particularly to use "Print Shop" and make colorful banners. The students indicated that the most difficult thing about using the computer was the length of time it took to find the right keys.

SUMMARY

In summarizing what has gone on so far this year, it seems that the children have practiced word processing quite a bit and used a lot of the science and social studies software. Class size is much reduced this year, so computer use has been primarily 1:1. The teacher feels much more self confident and has maintained her high level of enthusiasm. At the same time, she would like someone to spend more time observing her use of the lab and evaluate what she's doing. At this point there seems to be a need to integrate the software into the curriculum areas more effectively so they are seen as tools, rather than as isolated activities. Children get regular opportunities to use the lab and reflect their teacher's enthusiasm and expectations. There has been little individualizing except to the extent that children can usually work by themselves.

The greatest limitation of the implementation of the project at this site is that it merely includes a set of isolated activities to supplement instruction. There doesn't seem to be much integration of the material into the subject areas, except in language arts and story writing.

Site: IPS #18
Usage Category: Computer Lab
Site Visit: June 4, 1990
Field Staff: Anna Weiser

INTRODUCTION

Children attend the computer lab for a half an hour each day five days a week, with an extra hour per week if it is available. They work on whatever materials the teacher has planned, usually related to their curriculum. Students mostly work one to a computer because they prefer that to sharing. They like to make decisions individually, and the teacher can better see what they are doing that way. She did not receive the modem, nor were they involved in telecommunications.

The room is organized the same as last year with the computers and printers arranged around the walls of the class. Two important changes are the teacher's comfort in working with technology and her more effective integration of the material into the curriculum.

FINDINGS

Observation:

The activity observed in the lab during the site visit did not have anything to do with any of the stated goals or objectives of the usage category. The teacher mentioned that her class has gained in self confidence as a result of the activity in which they participated. A kindergarten child and one student from her class were seated at each computer. They were using "Fun from A-Z" from MECC. Each kindergarten child was to count or identify a letter, while the fourth grader helped him or her find the right keys to use on the keyboard. The task seemed much too complicated for the kindergarten children. They not only had to recognize a picture, but then identify the letter and find it on the keyboard. There were four letters to choose from each time. They had to move the cursor to the correct letter and hit enter. Some kindergartners verbalized the answer, and the fourth grade children did the keyboard. Others let the younger students do it all. Many of those who did everything for their younger partners seemed bored. While the goal of increased self confidence may have been a good one, this seemed more like using the computer as a novelty item.

The teacher has had a difficult time getting into the whole program, although it has been easier this year than last year. She feels the greatest personal benefit has been overcoming her fear of using a computer through learning how to use it. She also thinks finding new ways to work with science and story writing has been good for her students. The objective that they have

accomplished best has been to improve their keyboarding skills because they have increased to a great extent the amount of writing completed this year. The teacher commented that she tried to make work fun, but not "fun and games".

This teacher felt that less effective implementation had occurred due to the bureaucracy of having to work through the IPS central administration office. She said that the supervisor for computer instruction had no time to help her last year and didn't get to IPS #18 until March of this year. The channels she was told to go through for help did not respond to her requests. She did not contact Chris Franklin. When the computer(s) needed repair, the teacher took the children to the reading and math lab and called the computer repair department at IPS which has been better at responding to her requests. She said there was no time for networking this year, either, as "no one else had time for her." (It is difficult to separate this teacher's emotional reactions from the situation that actually existed. It does seem that she had difficulty getting support from IPS, but without corroborating information, it is difficult to present this point of view as a factor that hampered the success of the project.)

The teacher thinks she is at the level of familiarity that she should have been before becoming involved in the project. She feels much more comfortable using the computer. She understands how to use it better and is more apt to hunt for different things to incorporate into the curriculum.

Of greatest difficulty for this teacher was coordinating software for science and social studies. Some of it that she ordered last year never arrived, so she has borrowed materials from the other lab programs, such as "O'Dell Lake," "Animal Trackers," "Miner's Cave," and "Mystery Objects".

Instructional use this year has varied. Students have done letter and story writing, math drills, language work, problem solving, science; they have "tutored" kindergarten children as well. The teacher noted that children had improved in their ability to write stories. Not only are their stories longer, but they hesitate less before getting started, and they more readily self-correct before the teacher reviews it. They are composing right on the computer because they have had quite a bit of keyboarding instruction. The grammar, punctuation, titles and paragraphing are so much easier to change and teach to them on the computer that they have developed more positive attitudes toward writing.

Cooperative learning has occurred in the use of some programs that have been done as a whole class or in small groups. This includes the use of such software as "Oregon Trail," "O'Dell Lake," "Choices," and "Lemonade Stand". It has not, however, been a strong feature of this site.

There has been some use of teacher demonstration both on screen and in individual or small groups, some simulation and computer- assisted drill and practice with math and spelling, prefix and suffix use, compound words and "Word Munchers". Major instructional support has come from "Print Shop" for graphics production. The teacher has used the utility software a little and done some word processing herself.

Two benefits for students that the teacher identified were the variety of knowledge they have been exposed to as a result of participation in the project and the range of opportunities to solve problems than would have been possible in her classroom previously. More specific attitudinal changes have occurred in language arts and math. Students' attitudes are more positive about story writing, and "they love division on the computer, but not on paper!"

The teacher did not mention any examples of the impact on student achievement. Their work habits had improved to the extent that they wrote longer stories, there was greater willingness to perform long division, and there was more carryover from one computer lab session to the next than with the regular classroom lesson from one day to the next. Because children wrote longer stories, their creativity was increased, she said. With problem solving, they seemed to talk about more ways to solve problems than before.

The teacher has achieved some of her goals. She feels a lot more confident this year compared to last year. She has had the children do much more story writing, but has not received any of the other software that she says was ordered last year to coordinate with social studies and science. She does not feel that this goal has been achieved as effectively as she would have liked. She said she has received no guidance as to future computer use and intends to continue developing her project as well as she can, given the bureaucracy of the IPS system.

Students:

The three students interviewed all agreed that they had used the computer a lot more this year than last. One said he liked "Number Munchers" best because of the chase involved and he was good at math! A second liked "Oregon Trail" because he liked to hunt and trade things, and "the graphics are neat; it's hard and I like hard things." The third enjoyed "Oregon Trail" because she liked traveling and seeing old and different things.

When asked to indicate what they were most proud of, one child said playing different games. She also enjoyed teaching other children. A second student said he also liked learning more about all the games and teaching younger children than himself. Another

student was most proud of the fact that he could write his name without looking.

Students have composed on the computer anywhere from seven to twelve stories. They enjoyed this but looked forward to being able to pick their own topic in the future.

The students indicated that what makes learning on the computer fun is that you don't have to write and you don't get so tired. There was nothing difficult about using it. They preferred working by themselves to avoid disagreements or to be able to go at their own pace. One child admitted he didn't like to take turns.

Computer activities most frequently mentioned were practicing math problems and playing word or number games. The other things reported with some frequency were writing stories, keyboarding, learning science and health lessons, practicing spelling words, using the database, problem solving games or simulations, writing answers to the notebook for "Animal Trackers," and experiments or demonstrations.

When asked how they would set up a new computer program, none of the students interviewed was very imaginative, choosing to describe what they had pretty much experienced this past year. They tended to repeat what each had said before with a few cautions about making sure the disks are in right, or showing children where the keys are. One child wanted it to be a separate subject. Only one made any reference to having students work together in order to learn more than working independently. She also mentioned how they might be able to help each more that way.

SUMMARY

The major change that has occurred at this site since last year has been the increased confidence of the classroom teacher to work with computers and to incorporate software into the curriculum. While there has been an increase in the amount of composing on the computers compared to last year, she has not really effectively coordinated the software for science and social studies. There has been little use of the utility software. She has not shared to what extent there has been real individualization in learning. There does not seem to be any overall blending of lab activities with what is happening in the classroom. It seems more like this is just another thing to accomplish in the day.

The students' and teacher's responses to questions show they haven't really understood nor been involved with much depth in the goals of the program. Their experience has been, for the most part, superficial, fragmentary, and without much meaning except for its novelty.

Part of this could have been prevented with more advance planning and training for the teacher. She is an enthusiastic participant but has accepted almost no help from anyone in the almost two years she has been involved in the project. As a naive computer user, she should have been more closely guided and supervised so that she could have integrated the goals and objectives more effectively. Last year, the principal indicated that dealing with the central administration in getting the program started and continued was problematic. This year the teacher reported similar problems. In the beginning, disks were incorrectly formatted, and there were problems with the printer. Information on workshops arrived after they had been held. Support provided by the Department of Education was at a level that was beyond her new technical competence.

A computer mentor or networking system would be very helpful to beginning computer users involved in this sort of project. (ED: It should be noted that a computer mentor was available, but help was refused. Networking help was available through IDEAnet on the computer which required a modem and telecommunications software. Funding for this was available through the grant.) While it would not have been feasible with this project, frequent monitoring of progress, with some sort of monthly checklist and an occasional visit would have helped to identify problem areas before a semester or year is finished. Most important of all would be building in time into a teacher's schedule for attending workshops, or networking, or previewing software. Access to help at a level that is commensurate with a teacher's needs is critical.

Site: Spencer Elementary (Spencer-Owen)
Usage Category: Computer Lab
Site Visit: January 19, 1990
Field Staff: Lou Emge

INTRODUCTION

The computers at this site were used in a lab located in the media center. The computer area is very small, cramping chairs and stands for the twelve Apple computers. There were two printers, but only one was hooked up. Students have 30 minutes each day on the computer. Half the class is on the computer while the other half does non-computer work in the media center just outside the computer area. They then alternate for the next half hour. Students work almost exclusively 1:1. This is somewhat by teacher's choice, but also by necessity because of the very cramped computer area.

Most students were working on making designs when the class was observed. There seemed to be no real purpose to what they were doing as they were following step-by-step directions for a design and did not print it out when finished. A few students were doing some writing using "Fred Writer," but again with no apparent purpose, goal, or expected outcome. In talking with the teacher and students, it seemed that the main purpose of the computer project is to give the students 30 minutes per day with the computer. There seems to be no vision of how the students' computer use fits into the bigger picture of the school day and the overall curriculum.

Printing out what students have done--stories, notes, designs, etc.--still is not considered important enough to work out the printing limitations. Computer use starts when students leave the classroom with software in hand and ends when they return to the classroom and return the software. There seems to be little or no bridge between the hour the students are out of the classroom and in the media center to the rest of the school day.

The teacher and students like using the computer, but it does seem that the level at which they are using it is not worth the time and resources the computer project takes.

Computer use this year follows a pattern established last year. There is a real space limitation in the computer area; printing is not considered a priority, and there is no real linking of computer use to the rest of the curriculum. At the time of last spring's visit, students were observed working in pairs building a story by alternating the writing of sentences. The teacher had learned this technique at a spring workshop and, although the stories could not be printed, it seemed like a positive step toward

more meaningful computer use. The activity has not been done this year to date.

FINDINGS

Observation:

Computer use at this site is treated as an "extra," another block of time designated for a purpose such as leaving the room for gym or music. The principal purpose is to meet the 30 minutes/day of computer time for each student. Keyboarding, word processing, and writing receive emphasis. However, students report that stories are seldom, if ever printed. If the purpose of writing is communication, it would seem that there is little communication going on when student writing gets no further than bytes on their computer disk.

It should be noted that other aspects of this teacher's instruction reflected both conscientiousness and creativity. As the evaluator waited to conduct an after-school interview, it was observed that there were many good things going on. There just isn't a vision of how the computer fits into the bigger picture.

Teacher:

The teacher is happy to be part of the computer project this year. She learned a lot last year, particularly ways to incorporate the computer beyond her limited experience previous to the project. The biggest benefit to students is the excitement of it. They feel privileged to get to use the computers so much. The teacher also feels they get more personalized interaction in working with the computer. As a result of her involvement in the project, she feels she is a more careful planner in all of her teaching.

The teacher is familiar with the usage category description for the Computer Lab and feels she is doing the best job of "improving keyboarding, word processing, and process writing skills." The objective she feels will be accomplished the least is "to assist the student in planning individualized learning tasks." She hopes this year to feel more competent about what she wants and does not want to do with the computers--to have things planned out better. She is hoping the students will feel computers are a regular part of the curriculum rather than an extra or reward. (Note that the teacher recognized this as important, although it doesn't seem to be happening.)

Children use the computer about half the time for keyboarding and word processing using "Fred Writer" for a report on a planet and "Logo Writer" to create a space vehicle and write a description of it. (It was not clear whether either of these were printed for the students.) The teacher feels that all students are more

willing to make corrections and choose better words. She has avoided drill and practice and tutorial software because it is not an emphasis of the project.

Some other software that students use is "Miners Cave," a MECC simulation, "Carmen San Diego," and "Gertrude's Secrets". Students use the computers 30 minutes per day per the usage category. Activities are scheduled as follows: Monday and Wednesday students generally work on learning Logo Writer; Tuesday and Thursday they choose "Gertrude's Secrets" or some software to work on; and Friday they may work on a project involving some word processing.

Computer use is one-to-one almost exclusively because of the small area. There is only one printer hooked up (which seems to be viewed as a fact, rather than a problem to be overcome.)

The teacher felt the inservice this year was more specific and helpful than last year. She described no specific projects or areas that were to be explored and implemented this year.

Students:

Students liked using the computer but did not use the same detail in expressing their opinion as at other sites. They like using the computer more than not using it, but had no really good reasons why the computer was helpful. The students interviewed generally felt that using the computer is better than using paper and pencil.

When asked about writing, students all indicated that they had done some writing, but the only thing printed out was a Christmas card using "Print Shop". One student talked about creating a crossword puzzle. He traded disks with someone else, but it was not printed. Keyboarding and writing are a large part of what they do. They did mention using science software on parts of the body, doing quite a bit with practicing spelling words, and miscellaneous other software such as those mentioned already and "Chief of Detectives".

The teacher had demonstrated one or two programs to the students in the room using the large projection screen. This was strictly to teach them how to use the software, not for any kind of instructional demonstration.

Each of the students seemed to have found a certain program or two they particularly liked. They are exposed to quite a bit through the general free-choice/teacher-choice mode of planning computer use.

One student wanted to get to play more games and "use some software about finding counties and countries." Another had seen "Garfield's Adventures" but had not gotten to use it yet. The

third student could not think of anything in particular he wanted to do more of on the computer.

Students liked working by themselves because when they work in pairs, it is so crowded that it hasn't been a very positive experience.

SUMMARY

The project has not developed beyond a very low-level use of the computer as an educational tool. Students are becoming familiar with the computer, are learning keyboarding and word processing, and get a chance to use different software. There isn't a vision of how the computer fits into the total school program. The study was set up with the idea that the sites would find this vision and implement a meaningful project, meeting the category's objectives.

There was no apparent progress from the previous year in developing a computer project that fits into the total school program. Not seeing the printing of student work as an important link to the rest of the curriculum exemplifies the continued separateness of the project.

Site:	Spencer Elementary (Spencer-Owen)
Usage Category:	Computer Lab
Site Visit:	May 11, 1990
Field Staff:	Lou Emge

INTRODUCTION

When looking over the objectives of the usage category, the kinds of words present in other categories--creativity, problem solving, enrichment, etc.--are not present in these objectives. Such phrases as individualized learning tasks, coordinate software with the curriculum, and process writing skills have a completely different tone than the ones first mentioned. The site was not very successful in using the objectives to create a vision of how the computer lab could be an integral and exciting way of furthering the school's curricular goals. Perhaps the tone of the objectives did not present the stimulus for this vision.

The third of three observations did not reveal any significant changes in computer use. The class goes to the cramped computer lab in the media center for two 30-minute periods (separated by recess) each afternoon. Half of the students work on the computers for 30 minutes, while the others do class work or read in the media center. They alternate for the last 30 minutes.

When students leave the classroom for the computer lab, they take disks, etc. along for their 30 minutes of computer time. What they do is sometimes self-selected and sometimes assigned by the teacher. During computer time, students are involved in a computer activity with no outcome or product required. There is little connection to the regular curriculum--one of the four objectives of the usage category. An exception would be in the use of some Indiana History software which is part of the fourth grade curriculum. There is still no particular importance given to printing out student work.

FINDINGS

<u>Observation:</u>

Students were working on Logo Writer with a "Rocket Takeoff". Following directions, they created the top half of a rocket, then the bottom half, then put the two together. There seemed to be no particular direction or reason for what they were doing, other than that they liked doing it. Nothing was printed out. This seems typical of most lab activities. There is no real educational goal or outcome expected. The goal seems to be to involve the students for 30 minutes per day on activities they like to do and which loosely fit into the usage category.

Teacher:

One of the teacher logs describes an activity which reflects the teacher's initiative and pride in what her students have learned. On May 3, the computer class held an all-day "Computer Fair" during which they invited third and fourth grade classes to come to the lab at 30 minute intervals. The computer students "taught" the guests to use programs in five categories: 1) simulations; 2) word processing; 3) problem solving/learning and practice; 4) programming/databases; and 5) publishing. The program was repeated in the evening for the computer students' parents. A student welcomed guests with a (teacher-produced) slide show on computers. The teacher was very pleased as she observed her students demonstrating what they had learned.

Another log describes using "Friendly Tiler" for student entry of data on famous people in Indiana. The students had gathered data, and entering it went well. The teacher reported that only four entries out of the 30 were saved. There is no report of printing anything out.

The teacher interview brought little new information from previous visits. At the January visit, she had identified as personal goals for her computer involvement for the year to feel more competent about what she wanted and didn't want to do and to have things planned out better. She was not particularly pleased with her progress toward these goals. The project started two years ago with a usage category description, a lab, a willing teacher, and some software. Creating meaningful uses of the computer to enhance instruction and the curriculum was left to the teacher. In this case, a single teacher (without the benefit of several project teachers working together as at most sites) never could quite create the vision of how to use the computers effectively.

The goal she set for her students was that their computer use was a regular part of the curriculum, rather than an extra reward or bonus. She felt this was not accomplished to a great degree. She did feel it was more a part of the curriculum than, for instance, P.E.(!), but not nearly where she would have liked it to be. The teacher knew what she wanted to happen; she just wasn't able to figure out on her own how to get there. This reinforces the feeling of this evaluator that it takes preparation and training to implement effective computer uses in the classroom. A good classroom teacher, hardware, and software are not enough.

Children did use word processing using "Fred Writer" quite a bit. However, as in previous reports, the benefit of printing as an important step in the writing process was missing. The writing assignments were not particularly linked to the regular curriculum.

Students:

All three students mentioned using "Logo Writer" to create designs as the computer activity they like the best. One student mentioned making a story to go with a design. They reported seldom printing the design. This is the activity that was observed and for which it was difficult to see a purpose or connection to anything in the regular curriculum. It was an example of a computer activity that children liked to do, so they did it. Apparently, the teacher thought it was enough of a benefit for the students just to become familiar with computers and do lots of different things on them. As mentioned, her students were very successful at the computer fair in showing schoolmates and parents how to run the software they had been using. But most of this software did little to further the objectives of the usage category.

SUMMARY

The project was not very successful in accomplishing the objectives of the usage category. Some things to be learned from this site include the following:

A single teacher in a building trying to plan and implement an innovative project without a lot of outside assistance will have difficulty implementing a successful project. The mutual support and sharing of ideas that facilitate the process are not available.

A direction and vision must be supplied as to what can be accomplished. Without it, computer use can turn into a day-to-day activity, rather than a planned part of student learning related to the curriculum.

Computer setup is very important and should be given careful consideration. In most sites this was not a problem, but at this site it was a major problem. It was simply tolerated as the only possible situation, rather than recognized as a problem to be overcome. The crowded lab area was a detriment to any flexibility in using the computers, hooking up printers in a different configuration, grouping students, etc. from the beginning of the project. Even if all other conditions were very favorable, the environment in which the computers were used would have severely limited any success. It was not an environment conducive to learning. A conducive computer environment should be considered a prerequisite for starting a computer project. This situation certainly did not promote any creative thinking about computer use. The ability to print student work immediately upon completion is also very important.

It should also be noted that the teacher made the following recommendations based on her experience with the project.

Provide more space for the lab.

Have at least one computer in the regular classroom with a printer, dual disk drive, and access to LCD projector. She thought this was important enough to bring her own in from home this spring. She seemed to feel that it was late enough in the project that it would not hurt implementation of the usage category.

ONE COMPUTER/CLASSROOM

Site: Wheeler Elementary (Speedway)
Usage Category: One Computer/Classroom
Site Visit: January 26, 1990
Field Staff: Lou Emge

INTRODUCTION

The computer is located in the back of the room, and there is usually a small group of students working at it. Apparently a big part of current computer use in this classroom is to find time for groups of students to rotate to the computer to work on teacher or student-selected software. The class is larger this year, 20+, compared to last year's 15-19. It was evident that the projection screen was not hooked to the computer, so apparently was not functioning for student demonstration. In later conversation, the teacher said it did not produce a clear enough picture so she preferred a larger screen TV or having students around the monitor.

Last year during site visits, there was an earthquake simulation using the single computer in the fall and four groups of four students each doing a simulation of settling a new planet in the spring. Both of these activities used the power of the computer as a teaching tool--one for demonstration and experimentation, and the other for using a single computer with multiple, cooperative groups. These are optimal instructional uses of the single computer. There did not seem to be this same keen spirit of challenge on the part of the teacher or students this year.

FINDINGS

Observation:

During this site visit, there was not much possibility to observe student use of computers, as there was a small group working on some self-selected software. The group was taking its turn in a rotation of groups that may take several days. During the rotation, the students generally get an opportunity to work on software of their own choice. In talking with the teacher, it seems as though much too much energy is being spent trying to get kids to the computers in small groups, rather than finding the most meaningful learning activities utilizing the power of the computer.

Teacher:

In reviewing her involvement to this point, the teacher indicated that computers had motivated her in her teaching. It was something new and different. This initial enthusiasm seemed,

however, to have diminished a bit this year. She talked about having a larger and more difficult class to handle, and more low achievers, which takes a lot of her energies. The spark of creativity and challenge did not seem to be there to the same extent as last year. Although she seems to receive encouragement and support from her principal and other staff members, it is difficult to continue to put in that extra effort, despite all odds. This observation suggests that there is a need to give continuous nurturing, support, and new direction and challenge to any new program. We want it to be institutionalized, not to flourish and than fade.

This teacher is still doing some very good things and has what it takes to continue to grow. Her principal is very proud of her work and says that two computers were added to the building this year because of the interest generated by the project.

As reported last year, the teacher feels her involvement with the single computer has made significant changes in her regular teaching, particularly in the use of cooperative groups for learning.

It seems as though the teacher is concentrating more on finding ways to revolve small groups of students onto the computer, rather than trying to use the computer as a teaching tool. She has expanded on the use of "Science Kit" experiments and the Tom Snyder simulations this year, but at this point she hasn't seemed to have found additional ways of making good instructional use of the single computer. After learning several specific activities last year, she has been able to integrate them into the curriculum much better this year. She does want to get into databases, which the evaluator encouraged.

There is a lot of good software being used by the students--activities that meet the objectives of the usage category which is not likely with a single computer. However, much of this is a result of student choice in rotating groups. This somewhat random use, even of good software, does not lend itself to meaningful integration with the curriculum.

<u>Students:</u>

The three students interviewed said they really liked when the things they did were printed and that they want to do more printing. Any of the sites that are not fully utilizing printing capabilities are missing a real learning opportunity. Building a portfolio of student work would start to add an accountability feature to student computer use, an aspect that has not even been considered at most of the sites.

One student reported that it is fair that the computers are for students who get their work done. (ED: There were several

sites where the computer was used as a reward.) The same student said that using the computer for learning was fun because you don't get grades. The students all reported liking to work on the computer with other students, mostly for the extra help, and most also said that it was fun. One reported she liked to see what her opponent "thinks about things."

Students reported being involved in many math, science, and social studies activities. The single computer was often used for experimentation or demonstration, but seldom using the projection screen. The teacher reported that the quality of the picture is so poor, it is not very useful. Students usually huddle around the monitor or perhaps watch on a larger screen TV.

Students reported no involvement in such things as writing stories, learning the keyboard, practicing spelling, or writing answers to textbook questions. This is very positive as these are not part of the usage category and have tended to be distractors in other projects where they are not objectives. The students are involved in computer activities that are consistent with the usage category.

SUMMARY

The project is doing fairly well but has not shown the same rate of development that might have been hoped for based on the first year's progress. There are many, many good things happening, particularly when one considers the minimal hardware investment compared to most other usage categories. The teacher reported that she has a larger class than last year, and there are more very low achievers and more discipline problems. Much of her energy is going toward these factors and less toward innovation and learning in the computer area.

Like many other sites, student use of computers is viewed as an extra, and there is little accountability. One might consider that when student accountability begins to be an area of interest to the teacher, it is an indicator of the maturing of computer use. It tends to show that the teacher is confident enough with computer use to be able to have expectations about what children should learn and accomplish. The building of a portfolio of student products seems like a possible first step towards accountability. The portfolio could serve as a record of student growth during the course of the year.

In conclusion, the project has potential for providing valuable information for the development of computer usage models. It would help if attention were focused toward refining some particularly strong features such as the whole-class demonstrations and the cooperative group simulations. As mentioned in last year's report, the single computer would best be used in conjunction with a school lab where students could learn keyboarding, word

processing, and on-going reading/writing activities. The cost effectiveness of the single computer makes its use particularly important to wide-spread use.

Site:	Wheeler Elementary (Speedway)
Usage Category:	One Computer/Classroom
Site Visit:	June 4, 1990
Field Staff:	Lou Emge

INTRODUCTION

The single computer and printer, with a number of peripherals, are set up as a station in the back of the classroom. A 26-inch color TV is used with the computer for whole-class viewing. The computer is used for whole-class activities for one-hour periods, three times per week. Students are working individually, or in groups at the computer for about half of the remaining class time.

The project has added "Laser Disk," "Hyper Media Studio," "Slide Shop," and "Video Eyes". The teacher reports that she has learned a little about how these programs work but has not yet moved to integrating their use into classroom activities. This comment appears to reflect the fact that she has a definite purpose and goal in mind for the computer--to integrate its use into the curriculum.

A significant change in computer use was reported by the teacher from the January to the June visit. In January, it was reported that the teacher seemed to have lost sight of some of the good things she had been doing last year. She talked little about using whole-class and cooperative work group activities utilizing science demonstrations, Tom Snyder software, etc. She was trying to create a workable schedule to get all students to the single computer for a period of time each week. It seemed to be taking most of her computer-directed energies.

She was frustrated with this strategy as it is difficult, if not impossible, to find enough time during the day when students can be missing whole-class activities to be back at the computer. The issue was discussed last year in conjunction with the fourth usage category objective, "promote the use of individually-paced learning activities." At the time, it was pointed out that this is inconsistent with the single computer and should be ignored as an objective. Although it was not part of the usage category description this year, she apparently decided it was important enough to pursue. She may have done this some last year, and it did not cause a big problem. Last year she had an extremely small class with few low achievers. This year she has a much larger class, more low achievers, and students coming and going during the year.

At the spring visit, the first thing she told the evaluator, with a great sense of relief, was that she totally did away with attempts to revolve all students to the computer. She went back to whole-group instruction and having students figure things out

on their own, utilizing some class time plus non-class time (lunch, recess). She had also abandoned the LCD viewer. Its projection was not sharp enough for students to see well. She is now very pleased with a 26-inch color TV monitor for whole-class viewing.

FINDINGS

Teacher interview:

At the January visit, the teacher talked about two computer goals she had for the year. One was to learn about data bases, which she didn't do at all. The other was to try all of her programs at least a little. She feels she did a good job with this. She continues to develop a sound philosophy of computer use in her single-computer classroom, a philosophy which says that the computer use needs to be integrated into the curriculum.

As mentioned in the introduction, she had abandoned attempts to schedule computer time for all students each week. She utilized three one-hour periods of whole-class computer use each week, and there was also flexible student use for about 50% of the remainder of classroom time. She also said there was a great deal of computer use during recess, lunch, and other non-class time. Students would figure out software, then teach it to the teacher and class using the big-screen TV monitor. An example is "Hyper Media Studio" which involves graphics, text, and utilizes buttons similar to the "Hypercard" stacks used on the Macintosh. One of the students interviewed described learning this and teaching the class. It was one of the things that the student reported as really making computers fun.

A disadvantage of this less formal use of the computer was that there was very uneven student use. Students generally used the computer when they had completed regular classwork. Some students got a lot of extra computer time, and others got very little. Unfortunately, those having less access are the slower students because it takes them longer to complete regular classroom assignments. These are students that other sites have reported as benefiting a great deal from using the computer. A goal for her students had been that all would be familiar and at ease with the computer--not an easy goal for a single-computer classroom. She reported in the spring that probably only about 70% of her students reached this level. This is unfortunate, but perhaps inevitable because of the limitations of a single computer.

The teacher's biggest accomplishment since the last visit was locating two geography programs which fit right into the curriculum and are very effective. One is "GEO World," and the other is "Agent USA". She mentioned that geography and weather programs really reinforced what she considers a weak curriculum for the students.

She also talked about students using simulations (during informal computer time.) "O'Dell Lake," which is a food chain simulation, and "Hot Dog Stand" are two she mentioned by name. She said students used problem-solving and game software for math. The math was very beneficial to students and did not involve tutorial or drill and practice.

Student interviews:

Students reported a variety of activities that they liked best. One said all activities; another said "Decisions-Decisions," Tom Snyder software specifically designed to utilize a single computer, and the third listed "Challenge Math," "Agent USA" (geography), and "Incredible Laboratory". They reported writing no stories or using the computer at all for typing. This is consistent with the intent of the usage category. One student wished they could do writing on the computer as she uses a computer at home for this.

When asked how they would use the computer if they were the teacher, one student said he liked they way they were doing it and would do it about the same. He is a student who gets maximum time at the computer and has figured out and presented software. Another student mentioned letting kids demonstrate things to the whole class with the student picking others to be at the keyboard and the rest watching on the monitor. She also mentioned that people would go to the computer to work on things after their work is done. One other student said she would use the computer for things that fit into the curriculum. (Perhaps she should become the teacher at some of the other sites where they haven't grasped this!) She would use "Print Shop" to enhance notes to parents. In general, her arrangement would be about the same except that she would have a group schedule for computer use.

SUMMARY

The project was quite successful in developing the single-computer concept. There were rough spots, but the teacher continued to strive for computer activities that enhanced her curriculum. She seemed to evaluate software on how well it could be used with the single computer and how well the content or activity would fit the regular curriculum. The fact that students really liked using the software, a major criteria at some sights, was secondary in this project because students had little individual or small-group time to use software such as "Jr. Jeopardy" or "Carmen Sandiego".

In a way similar to Mac sites which present little packaged software, this site had only one computer so word processing and writing could not be a major component, and it was not possible to find some exciting, user-friendly software to entertain the

students. As at the Mac sight, the teacher was forced to look for better uses of the computer for the particular situation. The point is not that the Mac Mini-lab or a single computer is the best answer, but rather that teachers need to be taught better uses of the computer from the very beginning. This needs to happen before they latch onto word processing and friendly software as the only answers.

A real drawback to this usage category is not that there is a single computer, but the fact that a single teacher in the building was developing this project. If at least two classrooms at the same grade level in a building are developing and implementing such a project, it would have a greater chance of success. It would be easier on the teachers, and it would be a more positive experience. It would show more consistency in sustaining effort as the two teachers would smooth out the highs and lows experienced in any new project. Most importantly, there would be more and better ideas used. The teaming approach was noted in other sites as one that contributed to greater degrees of success.

As mentioned in earlier reports about this site, the single computer concept would work most effectively if the teacher and class also had access to a school computer lab for perhaps one or two hours per week. This would allow for hands-on use which builds familiarity and confidence, would even out access to the computer for low achievers and would allow for doing some writing activities. It could also widen the possibilities for the single computer in the classroom as students could follow up individually or in small groups on classroom computer activities. Other uses of computers, such as developing a social studies report, could be planned in the classroom.

Access to a lab would also give students a chance to print out their own work. While they had one printer available, it was not enough to give easy accessibility to students. Printing things that students did on a computer in many cases brings closure to the activity and links it more closely to the rest of the student's educational experience. When, day after day, a student walks away from the computer with a disk or without anything, it isolates the computer activity from the rest of the student's learning. Building a folder of computer activities is a sound educational practice and beginning to be used in some projects. Students or teachers showing parents student work is much more effective than merely telling them. Access to more than the single computer is necessary if this is to happen.

When asked what she would do differently if she were not constrained by the usage category of the research study, the teacher indicated that she would sift through the software (assuming she has her present knowledge of two years in the project) and choose the best ones. There is too much to

effectively use it all. She feels she can now better plan ways to fit the software into the curriculum because she knows what it is and can do. And she would "beg for more computers, a minimum of three."

Site: Hope Elementary (Flatrock/Hawcreek)
Usage Category: One Computer/Classroom
Site Visit: January 19, 1990
Field Staff: Anna Weiser

INTRODUCTION

A great deal of excitement and pride was evident at Hope Elementary this year because of the new architecturally beautiful building. Situated at the edge of town, its unique exterior design somewhat resembles a small mall. Inside as you walk through the vaulted-ceiling halls, you observe students working in large classrooms. This fact is mentioned in order to provide a context for the summary of findings concerning the computer project in the fourth grade classroom.

This site has one Apple IIGS in the classroom. The objectives of the program are to allow students to explore math, science, and social studies concepts. It is hoped they will improve in problem solving and higher-order thinking skills. The teacher has a much larger class this year than last year. In the beginning, they were excited about the new school, and, as indicated by the teacher, comparatively less mature than last year's students, so she used the computer mostly for demonstrations to the whole class. As of January, their ability to work independently in the classroom and cooperatively on the computer has developed, so she has established a schedule with something for everyone to work on every week. She still frequently uses the computer to introduce a unit and then lets the students work at the computer with the same software.

Students have also been involved in cooperative learning experiences with three on the computer at a time. They have been working on problem solving and also in the subject matter areas. Students almost always work together on a rotation schedule, about 30 minutes/day--up to a couple hours per week.

Due to the increased number of students and comparative lack of maturity, children have not become as deeply involved yet in using the computer. This is a different classroom, smaller than the one in the old school. The computer is at the front of the room.

FINDINGS

Observation:

Students were using a unit on the human body to help them learn the various parts and how each functioned. This was an extension of a health unit on the same topic.

Teacher:

The teacher, who was involved in the project last year, is a very knowledgeable, enthusiastic participant. She said, "Personally, I have learned so much about computer use and had so many opportunities to learn about software. It has stimulated me in a new way so I can stimulate kids and be enthusiastic."

The teacher feels that one of the most difficult objectives to accomplish will be problem solving, but with the software she is using, they will be able to accomplish this effectively. Many of the disks the students use involve problem solving in science and social studies. The children have also had varied opportunities to work independently as well as cooperatively. They have had the assignment of writing a story with certain elements in it. One child is responsible for each section, but the others help edit, and together the groups produce a final project.

According to this teacher, the training program in which she participated this year was more helpful than last year's because she had more experience, and there was more time to prepare for the training. What was especially valuable was sharing with other members in the same computer category. They have discussed how they have used the different software programs. The class sent pen pal letters to another class. It is hoped that students from the Speedway project will be able to visit Hope Elementary. They would like to be able to communicate between the two schools using the modem.

The teacher has no qualms about using the computer or any of the software, sometimes even giving it to a small group of children to read the manual, figure it out, and then teach her. She has had no complaints or serious technical problems. The modem had just been hooked up, and everyone was still becoming familiar with it. Students were having some difficulty going from one menu to another smoothly. The utility software and graphics production have had little use, although the latter is a priority for the second semester. Moderate use of teacher word processing and desk top publishing of a magazine has occurred. The class has used the database/spreadsheet quite a bit.

The teacher feels that due to her work last year, she can integrate the computer/goals into the curriculum more effectively this year. As children become better at working cooperatively, she has extended that concept into the regular program. Frequently, three children work together.

Two examples of instructional use are given here. Through the use of software on the "Body in Focus," students have learned more about the subject and been able to apply it in their health unit. The teacher has access to a video camera and the children are creating a tape, "A Trip To the Fourth Grade at Hope Elementary

School." The students are writing the scripts in which each will have a part to read.

The most frequent use of computers at the beginning of school was for teacher demonstration and classroom simulations. Children worked on "Oregon Trail" and "O'Dell Lake". In moderate use was thinking skills software, although that is also a high priority for the second semester. Children have spent a little time on keyboarding and student word processing.

Computers have not been used much for writing except to put limericks on the screen to show the form. The teacher used desktop publishing to create a magazine with poems which the children had to correct and edit first.

When studying animals, students developed questions and used the database to find answers and even take tests. With a study of plants, each group created information and put it on a database.

Due to the immaturity and size of her present class and the move to the new school, the teacher and principal feel it's too soon to see specific effects on students. With last year's students, though, children were able to use the computers independently and daily. They frequently figured out things for themselves. It was very motivating to them, and they eagerly anticipated using it frequently.

There have been attitudinal changes on the part of students toward school, but neither the teacher nor the principal, know if it's due to the computer or the new school. With this year's class, children are required to complete their daily work in order to be able to use the computer every day. Some students lack the attention span or maturity level to do much problem solving yet, while others are not intimidated by its use and can figure out much for themselves. It would also be premature, she says, to say if the computer has influenced their creativity because so much of what is happening in the classroom is interrelated.

This teacher is working to help her students become more responsible toward each other and the school environment, complete their work as well as they can, feel good about school and themselves and be stimulated about learning. She wants them to become more independent. They have made progress in this direction, but many still have a long way to go.

Future plans include more problem-solving opportunities, such as provided by "Wood Car Rally". Another goal is to use slide shop activities to share with other computer projects. The class will also expand their facility with graphics production.

Students:

All of the students interviewed seemed to be generally familiar with the keyboard, although two said they had some difficulty finding the keys at first. Their favorite programs were "Body in Focus," "Carmen San Diego," and "Think Quick".

Many of the disks were seen as games, but they all said the thing they liked best was, "You have to think hard," and "You have to think quick." Best of all, "When you know how to do it real good, (the teacher) has another one for you to do." The easiest ones were "O'Dell Lake," "Speedway Math,"--"if you can say your math facts;" and "Wood Car Rally". The most difficult was "Body in Focus,"--"because there is lots of stuff to learn." They also expressed the desire to learn more challenging programs "like they have in fifth and sixth grade."

For writing, they had created letters to send to students at Speedway Elementary, written limericks and poems, made a newspaper with stories and cartoons, and printed out a crossword puzzle.

The most difficult thing about the computer for the students is finding the keys. Children varied in their opinions of cooperative learning. Two thought it was a good idea for the harder programs "to help you decide." One much preferred working by himself because the others "were messing around too much." They felt it was definitely an advantage to have it in the room so everyone got to do something on it every day.

SUMMARY

At this time last year, due to a smaller class size and a larger room, children were further along in their explorations of the computer. With a larger number of students who seem less mature, it has been more difficult to implement the program as effectively. One computer per classroom has been too limiting. The teacher is a very determined, imaginative, enthusiastic teacher who will find a way to carry out the objectives of the program in an effective and exciting manner with her students. She would probably be more effective if she had a few more computers, especially if her class size remains as large.

Site:	Hope Elementary (Flatrock/Hawcreek)
Usage Category:	One Computer/Classroom
Site Visit:	May 15, 1990
Field Staff:	Anna Weiser

INTRODUCTION

The Apple IIGS is at the front of the room where it is connected to a television monitor. The teacher often uses it for large group presentations in social studies, science, and math. It has also been used with small groups where students can continue working with materials she may have already presented. Individually, students spend about one-half to one hour on the computer a week. The modem is not in use at this time, since it needs repair, and the company that installed it has been very slow in getting around to the school.

This is very different from what was observed last year. First of all, the whole school is in a brand new building, creating a lot of enthusiasm and excitement. The fourth grade classroom is much smaller than the one the teacher had in the old school. Additionally, she has many more students, so there is almost no room to place the computer, so small groups or pairs can work on it without it being a distraction. This year's class is less mature compared to last year's, so they have had fewer opportunities to work independently because the teacher did not feel they were ready to handle that. As a result of the number and size limitations, the teacher has used the computer much more this year to make whole class presentations. She also has had the children involved in using a laser video disc player.

FINDINGS

Observation:

Students were having a science lesson on animals using their textbook. During the reading and discussion of the material, the teacher was paging through material about mammals on a science disc to find examples that further explained what was in the text. This was an encyclopedic type of reference which helped broaden children's understanding of the topic. Most children were attentively reading and listening or participating in the discussion. The classroom was stuffy, and there were too many children for the space.

Teacher:

The teacher understands the usage category well. She said that problem solving and higher thinking skills as well as variety in presentations were the two items she was able to accomplish the most effectively. The most difficult objective was cooperative

learning, due to the immaturity of the children; some of them had problems responding to expectations. They were very passive, or, given choices, they would do the same things over and over. They were not interested in trying new things. She had surveyed them informally and found that many of these same students were frequent television viewers.

The two areas that were important to this teacher were having a tool that allowed her to present a lot of information that is difficult to present in any other way. She was referring to the science material and problem solving materials that the class used. With the use of the laser video disc player for science, the children were learning much about the potential for technology as learning aids in the classroom.

The teacher had no training this year beyond that provided during the summer before second-year implementation. There was an opportunity to network the first semester with a couple other sites, but it did not continue to any great extent. She used the modem initially to communicate with Chris Franklin, but it broke down and hasn't been fixed yet.

As a result of being involved this past year, the teacher has altered some things in her classroom. She uses the monitor more and the blackboard less. She has tried to use cooperative learning techniques in other situations besides the computer. Her curiosity has been aroused so that she is interested in trying new things.

The major use for the computer this year has been in demonstration. Then students are allowed to use the computer themselves to figure things out. They have been free to explore, look at the menus and experiment. She had intended for the children to work in small groups and explore on their own, but this has not worked well. She said many of them come from PRIME TIME (class-size reduction program in K-third grades) classrooms with small numbers, and they haven't learned to become independent. They don't feel good as a result of a challenge, or achievement appears to not mean very much to them. She has found it easier to use the computer to get their attention in order to demonstrate material.

The cooperative learning activities they did included planning menus for a health unit and developing a database of local Hope businesses. There was very little writing done on the computer due to the category.

Extensive use of demonstrations and thinking skills software has occurred. Moderate use of simulations and database/spreadsheet has occurred. There has been a little tutorial material used, enough keyboarding instruction not to waste time, and a little student word processing. The teacher has used all the instructional support available, except the on-line database

searching. She was a competent computer person before becoming involved in this project and felt comfortable with most of it.

The teacher did not identify any attitudinal changes attributable to the computer, although she did indicate that some students became better at following directions and figuring things out for themselves. This was probably one of the most important benefits to the students. They used software such as "Decision, Decisions" by Tom Snyder for this. A further benefit to them was that it enhanced the variety of ways to present material to them.

The students did not achieve the goals that she had set for them as well as she had hoped. They did accomplish some problem solving, but no programming instruction. They did send some slides to another computer project. Cooperative learning activities were not successful to any great extent. One of her goals had been to help de-mystify computers for the other teachers at the school, since there has been lots of hesitation in using them. While she feels they have made progress in this area, many of them are still reluctant because they see using the computer as another subject to be fit into the day instead of using it as an instructional tool.

Students:

The students interviewed indicated that they had used the computer less this year than last; one had access to a lab situation, and the other was in a class that had two computers in the room. In both of those settings, they had opportunities for much drill and practice. Another child said he had used a computer much more this year.

Favorite activities identified by the students included "Carmen San Diego" because they like to solve problems and mysteries. One child liked "Animate" because he liked to draw and make things move. When asked what they were the most proud of, the two responded about solving a problem on the computer with "Carmen San Diego". Another student said he felt good about knowing where to put his hands on the keys and how to type fast.

All of the children interviewed had written one story on paper first and then typed it into the computers. Still to be learned they hoped, were to use "Animate" in order to get more proficient at it.

The students referred to the game-like qualities of the computer as what was the most fun. "I get to solve mysteries, do something new I haven't done before;" "The computer is better than Nintendo because you can program it;" "A computer is better than a typewriter, because you don't get to play games on a typewriter."

Difficulties encountered by students were in changing a data disk to a program disk or getting started and not knowing exactly what to do. One child referred to a particular program and his difficulty figuring it out correctly.

The only activities children had not done this year were to practice spelling words and write answers to textbook questions. Otherwise they had worked to some extent on all of the activities listed: practice math, write a story, keyboarding practice, play word games, learn science, health and social studies lessons, use the database, and other (wrote limericks and poems, paragraphs for stories, and used the video cassette recorder). Often they did problem solving and saw demonstrations.

Two students preferred working by themselves so they could concentrate, and no one would interfere with their work or get into disagreements. One preferred to work with another person so maybe they could help each other if the answer wasn't known.

The ideal classroom set-up, according to the students would be similar to what they had experienced except they wanted to have two or three computers and monitors for demonstration and work purposes. They all emphasized the importance of listening in order to understand what to do and being able to learn the keyboard in order to play the games. One wanted to learn how to program a disk to do things and learn history programs.

SUMMARY

The main changes this year are related to the new building with the reduced classroom size and the larger number of more immature students in this class. Both of these created limitations that were difficult to overcome. Despite this, the teacher persisted in trying to accomplish the objectives.

This teacher has well thought out ideas of how to use one computer per classroom effectively. She would use it mainly for demonstrations as she has done but definitely would like access to a computer lab so children could use computers more frequently both independently and in cooperative groups. She would include a large screen monitor, color monitors and a mouse with the II GS. She says you cannot look at using the computer as teaching another subject, but as another tool to enhance learning. That way it can be integrated into the instructional presentation. One of the most important things she would like to accomplish with its use is to get children to think for themselves, explore ideas on their own, and learn that they can accomplish this independently.

Training for teachers depends on the individual, according to this teacher. Some people need lots of guidance; others prefer to explore on their own. There needs to be enough training so teachers know what's available and how it can be used. Time needs

to be allocated long before implementing this sort of program for the training to occur, for children to be able to use a lab regularly, for hours to preview software, for opportunities to network.

Site: Austin Elementary (Scott County)
Usage Category: One Computer/Classroom
Site Visit: January 12, 1990
Field Staff: Anna Weiser

INTRODUCTION

Austin Elementary has one computer in the classroom connected to a printer. It is near the back of the room so students at their seats cannot observe the screen as they complete their other assignments. The teacher also has a computer at the front of the room connected to a large screen. Although she tries to keep a steady stream of students using the computer, sometimes that is not possible due to the curriculum expectations of the school.

Although computer use has continued to be two children at a time for the most part, the teacher has done more whole-class instruction with the large screen monitor this year than last year. For example, she has purchased additional science materials that have lent themselves well to explanations during science classes. There have been more small-group uses of the computer also.

FINDINGS

Observation:

On the day of the site visit, it did not seem that the enthusiasm for using the computer on either the part of the teacher or the students was as pronounced as last year. Both seemed pleased to be involved in the project, but time for everyone to use it was a problem. The teacher indicated that organization was sometimes difficult. While visiting, children were doing "Oregon Trail" in pairs, but frequently one of the two simply made all the decisions, while the other just watched. The decisions did not seem to reflect any thinking about what might happen but seemed to be random choices. All participants expressed disappointment that they couldn't use the computer lab so everyone could be working at the same time.

Teacher:

The teacher was involved with the computer project last year and still sees it as a wonderful opportunity to have broadened her knowledge of computers, their use and available software. She is familiar with and frustrated by the usage category. Exploring math, social studies, and science concepts and promoting more cooperative learning are the objectives that she feels will be most successfully accomplished. The one that will be most difficult to accomplish relates to enhancing higher-level thinking skills because there is such an emphasis on basics in the school

curriculum. Children have had lots of opportunities for cooperative learning, although as indicated above, where joint decision making did not really occur, cooperative learning can be reduced to simply sitting at the computer at the same time. The teacher has used the large screen monitor for much more extensive introduction and explanation in science and social studies. She feels much more comfortable with the programs and was able to start in right away at the beginning of the year. Having enough time to accomplish everything was cited as the problem.

The inservice training last summer was helpful, according to this teacher. Everyone knew each other better and what each was doing. Information on cooperative learning was useful, and communication was established. She liked being able to share with other schools in the same usage category. This was particularly valuable when discussing software effectiveness and utilization. Other teachers shared what they liked and didn't like before this teacher ordered new materials. She appreciated this as the catalog descriptions are not that explicit. She has used primarily Tom Snyder and Sunburst programs. Software is good, but sometimes the manuals are difficult to read. She prefers to learn by doing.

At this time, the computers are being used in math for facts practice, in problem solving situations and simulations. Organizational patterns include two to a computer, small group, and whole class. Keyboarding skills for the children take so long that not that many children can do any writing. There has been a little use of computer-assisted drill and practice, moderate use of teacher demonstration, and simulations. Children have had some use of the thinking skills software. The most significant non-computer change in teaching has been the increase in cooperative learning techniques in small-group activities.

Extensive use of the utility software has occurred for grade reports and graphics production. She has done some word processing, started learning the database, and been involved in a little desktop publishing. There has been no on-line database searching.

At this point, the two biggest benefits for her students have been the variety of software available to use in the class. Problem solving opportunities will come in the second semester along with most of the social studies and science materials she already has.

Some specific attitudinal changes in children she has noticed were noted as follows. She felt that if students can help someone else and demonstrate it on the computer, they feel better about themselves. This has been especially important with less able students. Often they can succeed in demonstrations, which not only makes them feel better, but helps other students to perceive them in a better light.

Work habits have improved in the class because children must complete their work in order to have their turn at the computer. It is too soon to see any results in student achievement, but the teacher has noticed that in class discussion, the children show that they have learned how to draw conclusions.

A personal goal for the teacher is to learn to use the database. Beyond what she mentioned as coming in the second semester, a goal for the children is also to learn the database and have more cooperative learning opportunities.

Students:

The students who were interviewed were pleased to be involved in the computer project this year. Two of them indicated there was lots more use than last year. They felt comfortable using it but still had trouble finding the keys without looking. One child liked "Oregon Trail" the best because "you get to make decisions and hunt and trade." It was "sort of like going to the store," he said. Another added that what he liked was that it was just like being "back in the old days," and it was fun. The third child liked "The Pond" because it involved getting patterns and following directions to get to the end. It is interesting that the children seem to be identifying with the processes involved as much as the content.

While students were happy to be involved with the computer, they all indicated frustration at not being able to use it more frequently and not being able to use it by themselves except during the 20-30 minutes of homeroom occasionally, or if a student finished an assignment, and no one was using it. They gave good reasons for their enthusiasm. "Computers are fun because sometimes they give you the answer, and you try and remember it and do it on your own. If you get it wrong, you have to do it over until you get it right. But if you make a mistake you don't feel so bad about it. Another neat thing about the computer is you get to try things you have never done before. You can guess at the answers." In "Oregon Trail," you learn about the pioneers because "you actually get to do it." They all stressed the game aspect of the software. In comparison, their papers and worksheets didn't have any of the "fun stuff" where you could type in an answer and see if it was right. A third child really enjoyed the more drill-oriented software such as "Word Munchers," "Math Blaster," and "Compound Words".

Although it was not one of the objectives, children had written one or two stories on the computer so far. This had been done at Halloween. They did not seem too excited about this, probably because of the difficulty in finding the keys. Additionally, the stories had been rotated in class or were fill-in the blanks. There wasn't much creativity or ownership.

There had been some practice of math problems, some word and number games. The teacher had often demonstrated social studies lessons to them, and they had done such problem solving games or simulations as "The Pond" and "Oregon Trail". One child had also practiced spelling words. The teacher had also used the large screen monitor to show the children how to do the games.

The children seemed to lack information about what opportunities and software was available, as their responses to what they wanted to learn yet were vague. One didn't know; one said "Street Fighters" because "you fight a lot" (although the teacher indicated it was not one of their programs), and another wanted to learn "Furs," a game in which you learn to trade.

The biggest problem about using the computer, as indicated by the students, was finding the right keys and starting over when an error was made. A third child didn't think there was anything difficult about it.

The students did not seem to mind working with their classmates at the computers, but they have had little or no experience using them independently, so they have no real basis of comparison. Those who had worked 1:1 seemed to want more opportunity to be able to do so. Their other frustration was in not being able to use it as frequently as they would like.

SUMMARY

A change this year which was noticeable to the evaluator was a diminished enthusiasm on the part of the teacher which seems to be reflected in the children as well. Possibly this is due to the lack of time for the children to use the computer, the curriculum requirements of the school stressing the basics, the opportunity for problem solving software being delayed until the second semester, or perhaps the visit just occurred on an inopportune day.

The way the computer is used hasn't changed. Everyone feels frustrated with not being able to use it more frequently and independently. The teacher is pleased to be able to use it for demonstrations and sees it as very useful, especially when considering some children benefit as much from seeing things as hearing them. She would like to be able to keep it but also use the lab in the school.

While the teacher is aware of how she can and should be using the computer, the children still see it as a novelty and game device. They said more about the processes of using it than what they were learning. Perhaps this is due to limited opportunities yet to see what they can do on it and that most of them have only had short periods of use for four and a half months. If children are to be expected to solve problems and think critically, they need to be given ample opportunity to experience this. It should

not be postponed until the basics are mastered. They need to have more chances to work independently.

Site:	Austin Elementary School (Scott County)
Usage Category:	One Computer/Classroom
Site Visit:	May 18, 1990
Field Staff:	Anna Weiser

INTRODUCTION

The current use of the computer in the classroom is comparable to the last visit. It is near the back of the room, so students at their desks cannot see the screen. The teacher has a computer of her own at the front in the center attached to a large screen monitor. Due to school curriculum demands for emphasis on the "basics," children are not using the computer as often as she would like. They continue to work mostly in pairs, or have whole group instruction using the TV monitor. Individually, children get at most, 15 minutes a day on the computer. In pairs, they get about 30 minutes every other day.

One important difference this year from any other visit, was the presence of a student teacher. The teacher reported that once this person became more skilled at using the textbook materials in the traditional way, that became her responsibility, and the integration of materials to supplement the text using the computer was managed by the teacher.

There is not that much difference between this year and last year in the amount of use by the children. Due to the usage category and school demands, the teacher continues to be frustrated in her efforts to individualize for the children and by the fact that she is not able to use the lab. She has incorporated the large screen monitor into her science, health and social studies teaching with whole class presentations on a regular basis, due to more software in these areas having been purchased. This is an increase over last year.

FINDINGS

Observation:

Students were in groups of about five or six, working on a simulation, "Urbanization, the Growth of Cities," part of the software "Decisions, Decisions" by Tom Snyder Productions. Given the example of a town which is barely maintaining itself economically and the opportunity for growing and developing due to the discovery of a valuable mineral useful in manufacturing, students were to read, follow directions, discuss, make decisions, and decide on various courses of action for the community dependent upon the outcome of their decisions. They were to think about the impact all this would have on the population of the community, the beauty of the surrounding countryside, the economy, jobs, schools, etc. They had a manual

in which they were supposed to read to gain some perspective for their discussions.

Some groups went through the motions of decision making, with little discussion among members. Others had lively discussions, especially those with one or two verbal, opinionated children as members. They sometimes read the paragraphs of advice which end with questions but never discussed what was just read or the questions. Usually two or three people decided what to do next. In several groups, one or two children were completely passive. This had already been done as a whole class activity. As each decision was made, a representative from each group fed it into the program, and the group received further instructions. At the end, each group received a score.

None of the groups did very well. The teacher did very little instruction during the process, except at the end when they were reviewing how they had gone through the project as a class. The teacher made the point (and students recognized it) that it was important to read the advisory paragraphs and discuss the questions and the answers more fully in order to make a better decision.

While the process of discovery and following directions was useful, the materials seemed somewhat beyond the comprehension of many of the students. There was a glossary for vocabulary in which students sometimes looked up words, but there didn't seem to be much connection between that activity and the reading and discussion process, placing the new information back into context. There did not appear to be anything that this was connected to in the curriculum.

Teacher:

The teacher understood the usage category well, but due to the limitations of time and availability of it, was regularly frustrated in her efforts to accomplish the goals as effectively as she would have liked. Professionally, she indicated that she appreciated the opportunity to learn about technology and incorporate it into her teaching as well as become more adept at using it. She feels comfortable using it as a supplement to textbook materials.

As she has each time she's been asked, this teacher faults the lack of training available, especially in previewing software. Having to preview all of it herself has been a monumental task, according to her. She would have appreciated instruction in how to more efficiently accomplish this. Or, it would have been helpful to have a resource person or computer lab instructor to whom to look for guidance with this sort of concern. She indicated that there was no chance for networking in the past four months.

One of the most remarkable things she feels, is that this experience has changed the way she teaches. It has made her much more flexible. She realizes that the children can accomplish a lot more than she previously thought. She has raised expectations for them. "I would like to throw out my plan book and teach science all day. Then I could integrate other subjects into science." This year's class was in noisy discussion groups compared to last year's visit when they were going over a written assignment out of a text book.

Another change has been the increase in group work. She has mixed both able and not so able students. Students have had whole class instruction, but mainly worked in pairs, which she thinks has been most effective. She has also gotten away from using the textbook so much. It often is identified as a reference. The computer has expanded what is taught in the class. She has shown other teachers how to use it and the video disc player in their classes.

The computer and monitor have also been used to introduce material. There has been some remedial work in math using "Bombers" and "Speedway Math," but the emphasis has really been on problem solving, she says. For this, they have used "Animal Trackers," "Ant Farm," "Iggy's Knees," "Safari Search," "Memory Building Blocks" from Sunburst, and "Decisions, Decisions" and "Timeliners" from Snyder. This area has received the most extensive emphasis. Teacher demonstration and simulations have been more moderately used.

There has been almost no writing done. Children have written little stories using "Rabbit Writer," but there hasn't been enough time for the word processing. That is a goal for using the lab next year.

As instructional support, the greatest use has been with the utility software and graphics production, using "Print Shop". A moderate amount of teacher word processing has occurred. The other categories have had little use.

One of the most important benefits her students gained was the "hidden learning" message, the knowledge that they could do something independently. Ironically, she says, this seems to have come about through the cooperative learning process. This was particularly evident with a couple of low reading ability students who were proud that they could show the class what they had accomplished on the computer and could help other students.

A specific example of the impact of computer use on achievement occurred in science, where students did much better on their outside work because they had problems solved on the computer first. The teacher seemed to think they were seeing this as real. Work habits have improved to the extent that

children need to complete some of their assignments before they are allowed to work on the computer so they do their work faster, often without a loss of accuracy. Some children have been given programs and instructions to figure out how they work. The teacher has seen creativity in this process, as they have pursued the solution differently from the way in which she would have, but still reached the same end point in being able to demonstrate the programs to their classmates effectively. A further sidelight of working cooperatively so much has been their willingness to interact more quickly than ever before which used to be spent sometimes complaining or off-task.

Problem solving is the goal she feels was accomplished best this year. She also said that cooperative learning processes were done well. There was no time for work with the database. This had been a goal for herself as well as the class. Since she did not feel she had mastered it, she was reluctant to start incorporating it.

Students:

Two of the students interviewed had used a computer in third grade a little; one had not. Two said they had used it a lot more this year, and one said a little more. Each gave a different response to his favorite activity. One said he liked "Wordmunchers" best because it was fun. Another liked "Iggy's Knees" the most because you have to try and duplicate the shapes shown on the screen. Another feature students indicated they liked about using the computer was the opportunity to work with their friends. One other student reported that he liked "Animal Trackers" because you have to be like a detective, trace tracks and write it down on your notepad. There are lots of things to do in it, and it gives you clues about what the animals eat. It seemed that the last child interviewed was the only one who understood what he was experiencing beyond the context of a "game."

None of the children interviewed had written a story on the computer, although one indicated that would be something he would like to do very much. He also liked taking "Wordmunchers" and using the little frog to gobble up words and figure out what the syllable is. "You learn something, and you get to have a good time. It isn't like real classwork where you don't have fun. You get to talk about it to your classmates and figure it out."

One student wanted to hook all the computers in school together and compete against each other. He wanted to put video games on them and also compete. He was looking at computer use as another game.

It is interesting that when the children were asked about what the class had done on the computer this year, only one item,

"demonstrations," was chosen equally often by all three children. Only one child had anything else in the "often" category and that was "play word or number games." Two had practiced math problems; one had worked on keyboarding on a typewriter at home; two had played some word or number games; all interviewed said they had learned some science, health, and social studies lessons.

When asked what the one thing that they had learned to do on the computer that they were most proud of, two of the children identified programs that they had used and their personal reasons for liking them, although one boy simply repeated what the other boy had previously stated in response to the question concerning what they liked best. A third said he liked all the programs they were using because "you learn things on them." "We just keep going on to other exciting programs." Apparently he was understanding better how the computer is intended to be used in the classroom as a tool for learning as opposed to a novelty on which to play games.

The greatest problems children had with working on the computer were not related to the computer itself, but to not having listened to directions and then not being able to figure out what to do with the program on which they were working. One child also lacked self confidence in feeling that she couldn't "play the game because you haven't ever played it before." All students interviewed concurred that working with someone else was the preferred method because of the opportunities for shared decision making and helping each other figure out answers.

When asked to design the ideal new computer program, the student who most understood what was occurring in the classroom was able to articulate quite well what would be useful. As reported by this student, he would ask the school board for enough money to have at least 10 computers in the classroom with racks (the others said 15) beside each desk so that there would be one person on each side. The teacher would first show students how to work together on the programs and share and help each other out. (One said how to type; one said how to play the games.) Next, the teacher would show students how to use the computer with fast keyboarding skills without looking at the keys. They would learn how to compete, but not get mad if one person wins and the other doesn't. (One said how to play games was next, and the other said how to type your name.)

SUMMARY

In reflecting upon what has occurred at Austin these past two years there are several areas to consider: the teacher, what has happened to the children, and the usage category. Last year's enthusiasm for being involved in the project suffered a slowdown in the middle of the second year, but the teacher seems

to have been able to regain her involved interest. She is a knowledgeable computer user with strong feelings of self confidence. Two ideas that seemed more apparent to the evaluator this year were the teacher's attitude about the value of cooperative learning--to the extent that she included it more frequently in her classroom--and matching children other than homogeneously. Another was the strength of her feelings about using the computer in as many ways as possible and relegating the text to the status of a reference. Flexibility became increasingly important to her, in the use of the computer and texts, but also in grouping and time for classwork. This is particularly significant because she described herself last year as a very traditional type teacher with close classroom control, everyone sitting in neat rows, working on the same alignments. In fact, that is what was observed last spring in her classroom.

What has happened to the children is less apparent. They seemed to have benefitted from the opportunities to work together in that they have become more tolerant of each other and have matured in being able to cooperate. Some seem to understand that the computer is really a tool, while many others still view it as a novelty and something on which to play games. It might be useful to interview students from last year's class who have had access to a computer lab this past year to see the kinds of attitude or behavioral changes that may have started last year and how those may have been extended this year.

The usage category itself, one computer/classroom, has been problematic, although the teacher has gotten around it somewhat by using it so much for whole class presentations or as a part of a smaller group activity where it could be used less frequently, but still effectively. She has been continually frustrated in her efforts at trying to individualize as much as she would have liked and is looking forward to access to the computer lab next year in order to do that. She fully intends to use it in a variety of ways in the curriculum at least 45 minutes for each student then, at least once a week. She will continue to use the one in her classroom in the same capacity that she has, for introductory, supplementary, or culminating activities. All students will be given keyboarding instruction at the beginning of the year also.

If this classroom set-up is duplicated, it should include regular access to a computer lab for the whole classroom so that children can have those individualized opportunities, especially in the area of creative writing. The responses by students and teachers at other sites where writing has occurred are so positive that access to a lab should be mandatory with this usage category.

Another area that should be addressed is the need for <u>time</u>. Teachers need more time to prepare and receive training before

school starts, more time and help in reviewing all the software available, more time and the opportunity to network with each other, and more time for the effective integration of the computer into the classroom. Perhaps a day of released time per month to work on these concerns could be allowed. Perhaps those teachers who are being given released time and who are serving as role models in their schools could also be expected to spend some of that time working with their colleagues to more effectively implement the computer into the curriculum.

Site:	Jefferson Elementary (Plymouth)
Usage Category:	One Computer/Classroom
Site Visit:	April 3, 1990
Field Staff:	Sheila Short

INTRODUCTION

Jefferson Elementary School in Plymouth, Indiana, is one of four elementary schools in the corporation. It is a K-5 school with a student population of about 320; the corporation serves about 2900 students. Last year, the principal reported that the staff at Jefferson, on the average, are 40 years old or older and have been at Jefferson for some time. The rate of turnover among teachers is extremely low.

The Plymouth computer project has been very effectively implemented this year. The success of the project has been largely due to a fresh attitude toward use of technology that has prevailed in the school. A new principal from South Bend School Corporation, where he served as a computer coordinator, has become the torchbearer of the fourth grade computer project and has established a computer lab at Jefferson this year. He has also provided extensive staff training on Appleworks, databases and spreadsheets. He is also a strong advocate for computer technology in the classroom.

The first visit to this site took place much later than the other projects in the study because of difficulties in arriving at a date that was acceptable to the school. Telephone interviews were conducted earlier in the spring semester to gather information about current implementation.

The objectives for the this usage category are as follows:

- to motivate students to actively explore math, science and social studies concepts;
- to enhance problem solving and higher level thinking skills;
- to encourage the use of a variety of presentation modes: individual, small and large group;
- to promote cooperative learning.

The project teacher is actively working on all four objectives, although it is difficult to find opportunities for individually-paced instructional activities. The teacher typically introduces a lesson in the area of science, math or social studies to the large group and follows it up with small group activities. Scheduling small groups for work on the one

computer for a class of thirty students has been somewhat of a challenge for the project teacher this year.

There has been a vast change in the project since last year that involves not only the presence of the new principal, but also new enthusiasm and growth on the part of the project teacher. She has shown tremendous growth since the beginning of the project last year. She's grown from a reluctant computer user to a strong advocate for technology. She has always advocated a holistic approach to teaching. In fact, it was this attitude that caused last year's principal to select her for the fourth grade computer project last year. At that time, she seemed a little overwhelmed by the responsibility and didn't seem to have a lot of direction.

The principal last year was somewhat disinterested in his attitude toward the project, specifically, and technology, generally. He could offer little support to the project teacher, other than strong verbal support. At the end of the first year of the project, she began to come into her own and demonstrate some confidence in her ability to implement the project successfully. During the site visit last spring, students were regularly involved in problem-solving activities introduced on the large screen to the entire class.

This year the project teacher has enjoyed watching her students grow in their knowledge of technology and watching their excitement increase. She indicated that in her classroom textbooks are used as supplements and resources that don't drive instruction. The other change that is evident in the program this year is the prevalent use of databases. She is using the Sunburst Databases that include the following:

- Our Town
- Memory Castle
- Mineral Database
- Climate and Weather Databases
- Colonial Times

The project teacher has used "Our Town" extensively to teach Indiana History and feels that her students enjoy using the databases. She uses "Foundations of State History" which is basically drill and practice that summarizes facts to help her students review for a test. Students read a passage about Indiana History from the large screen and then take turns responding to questions. She feels that this method still offers more excitement than reading the same passage and answering questions from a textbook.

FINDINGS

Observations:

Data were collected through student, teacher and principal interviews during this site visit.

Teachers:

The project teacher is in her second year on the fourth grade project and is familiar with the usage category and objectives of the project. She indicated that the biggest benefit she received from being involved in the project was being able to watch her students grow and develop into technology users. She also talked about the excitement that her students were experiencing serving as role models for the project. The project teacher has worked closely with the principle to promote the use of technology throughout the school and is now very comfortable with her role as lead teacher in the area of computers.

The project teacher has also indicated that she used the one computer in her classroom for large group demonstration and then schedules small groups (three students) for assigned follow-up activities. There are thirty students in the project classroom this year, so it takes quite a while to get through a follow-up activity, and this has also been a frustration for the teacher and her students. The students interviewed indicated that they mostly liked working alone rather than with other students. One student said that "she didn't like the hassle of going back and forth and having someone say you took my turn."

The teacher indicated that the fourth grade project had helped her students work together. She said that "they are learning to cooperate with one another and share. They are learning more patience." One of her goals for the project this year was to involve students in other types of technology, like using the laser disc player. She also feels that her students are leading the way for the whole school in promoting use of technology. She shared a story about how she had an informal discussion with one of the special education teachers who taught the emotionally handicapped students. The special education teacher described how she was trying to find something that she could do with her students that would have some meaning. She felt that she was spending a great portion of her time trying to control their behavior and not spending a great deal of time in actual instruction. The project teacher suggested that she consider taking her special students to the computer laboratory. At first, the special education teacher was opposed to the idea that her students could handle being in the lab and felt that they might even be destructive. The project teacher offered to pair her students with the emotionally handicapped students and

assist them to learn the basic commands and become familiar with the keyboard. As a result of the project students' one-on-one involvement, the special students got really excited about using the computers. According to the special education teacher, the students' overall behavior in the lab improved dramatically.

Students:

Students are quite excited about using the computer but have become frustrated about not being able to use the lab on a regular basis like the other students. The computer lab is directly across the hall from the project classroom, and the students are frequently asked to provide some hands-on assistance when other classes are in the lab and are having problems with the computers or with the software. In fact, the project students are known as Jefferson's computer technicians and are responsible for making sure the computers are turned off and for putting the software away at the end of each day. They also serve as troubleshooters when problems arise. Despite the fact that the project students don't get into the lab like the other students, they do manage to circumvent this project requirement from time to time as they assist others. The project teacher described how her students were paired with first graders on a writing project that the first graders were assigned. The fourth graders typed in the stories that the younger students dictated. After the stories were written and printed, the first graders drew pictures illustrating the stories.

The students interviewed also expressed frustration at never having the opportunity to work alone on the computer instead of always having to work with other students. One student said that "she didn't like the hassle of going back and forth and having someone say you took my turn."

SUMMARY

Despite a somewhat slow start up and lack of direction in the beginning phases of the first year of the project, this second year began with strength and direction. The project teacher, with excellent assistance and support from the new principal at Jefferson Elementary School, has taken charge of the project and is managing it with expertise and confidence this year.

Students are really enjoying their role as the computer experts at Jefferson and have learned to share their knowledge with others. It will be interesting to see if the students' excitement about their computer knowledge and the respect they have gained from it will wane once the novelty of using the computer has worn off.

Site:	Jefferson Elementary (Plymouth)
Usage Category:	One Computer/Classroom
Site Visit:	May 24, 1990
Field Staff:	Sheila Short

INTRODUCTION

At Jefferson Elementary School, the project teacher has been part of the project for both years. She has a very large class this year with thirty students and has had some difficulty trying to schedule computer use with such a large group. There is a computer lab directly across the hall from the project classroom, and it has been a large source of frustration for the teacher and her students, since they have not been able to use the lab on a regular basis like the other students. Along with the one computer, the teacher has a large-screen monitor that she uses for demonstrations to the whole class. Then students are assigned to smaller groups to work on a particular assignment or activity. During the onsite visit, the teacher indicated that the overall emphasis in her classroom has shifted from some traditional methods to a more holistic way of teaching.

The most notable changes from last year involve the teacher's attitude regarding computers and her expertise and facility with technology. At the beginning of the first year, the teacher implemented the project in a somewhat reluctant manner. She had been selected as the project teacher because of her willingness to learn about using the computer for instructional purposes. At that time, she had had no formal training and few informal experiences and opportunities on the computer. During the fall site visit last year, the teacher did not display the strong confidence in her ability to use the computer for instructional purposes that she displays this year. This year she has benefitted much from the administrative leadership and support in the area of technology from the new principal at Jefferson. He comes from the South Bend School Corporation where he spent three years as the computer coordinator; he is extremely knowledgeable about all aspects of technology and has promoted the notion of computers integrated into the existing curriculum throughout the school.

The principal's enthusiasm has certainly ignited the excitement about the project that the teacher had begun to feel last year. This year, the teacher, other classroom teachers, and students in the school have all blossomed in the area of technology. Under his leadership and direction, Jefferson now has a computer lab with 16 Apple computers that is scheduled on a regular basis by the other classroom teachers. Last year's principal had indicated that a lab would not be feasible because of lack of space in the building, and teachers had to share six

computers. According to the principal, teachers are showing a greater knowledge of and facility with computers at this point in time compared with earlier in the school year. He greatly contributed to this growth by providing teachers with training and support. He conducted five after-school training sessions on Appleworks, spreadsheets and databases, to provide a foundation on which the teachers could build and further develop. The principal feels that the teachers and students have a real commitment to technology now that they didn't have when he first arrived. He attributes part of this feeling to the project teacher and her students who have, in many ways, led the way for the rest of the teachers and students.

FINDINGS

Observation:

Data were collected through student and teacher interviews and classroom observation. During the spring site visit, three students worked on the computer using a "Jobs Activity" database from the Sunburst Communications Databases. Using the "Jobs" database of various craftsmen, tradesmen, of a certain historical period, students worked together to select the correct option from the database.

Teacher:

The project teacher was involved in the project last year and has shown considerable professional growth regarding computers and technology since the beginning of the project. She has taken charge of the project and has become proactive in promoting computer usage schoolwide.

The biggest benefits the teacher received from being involved in the project were seeing her students lead the way in technology in Jefferson and being actively involved in making a change in the school. She also noted that her students have benefitted by learning to share and help others and by expanding their knowledge of technology. The teacher recounted that her earlier goal had been to involve her students in other types of technology, and she feels that she has been successful in doing that. The teacher feels that her students have really learned to work cooperatively with one another and other students as well. They have also learned to have more patience with others as a result of the project. Since the project classroom is so large this year, the teacher frequently has to schedule ten groups of three students to work on the computer on some assignment that they have. Students have learned to wait patiently for their turns and to work together when they get their chance at the computer.

The teacher reported that they had not gotten a chance to use the modem this year because it was still on backorder. The phone line was installed in the principal's office earlier in the school year.

Students:

All students interviewed reported that they are using the computer a lot more this year compared to their third grade experience. One student said that his group got time on the computer almost every day for fifteen to thirty minutes. Despite the fact that this usage category does not carry a requirement for writing, all students stated that they did quite a bit of writing, averaging about five to ten stories this school year. One student reported that about half their writing assignments required that the students write down the story first and then type it. With the other half, they "thought it up out of their heads." Another student described his favorite writing activity as a story about running away. He stated that he had to describe how he survived on the streets and how the story had made him think about the dilemma of going home vs. staying away.

Because the project classroom is directly across the hall from the computer lab, the teacher and her students were constantly being asked this year questions about how to do certain things on the computer or about how to use a particular piece of software. According to the students, this was especially frustrating for them since they were not supposed to have access to the lab. The teacher agreed that it was difficult because she experienced the same kind of frustration at times.

It was interesting to note that when students were asked if they liked using the computer alone or with other students, students reported that they would rather use it alone so that "you can go on it one on one and don't have to take turns."

SUMMARY

This year, the project teacher has assumed control of the project, has set definite goals and objectives for the project and students, and has set a course to attain those goals. For a variety of reasons, the project has really taken off this second year of implementation. The new principal has not only been extremely supportive of the project but has also been instrumental in causing a new wave of technology in this school, where last year six computers were shared by all teachers. This year for the first time, Jefferson enjoys a new computer lab with sixteen computers. Project students have enjoyed their role as computer experts at Jefferson and have maintained their enthusiasm about the project, while at the same time admitting the frustration of not having access to more computers for use

with the whole class. The students have learned, not only to work cooperatively with each other, but to share and help others, especially in the area of technology.

The project teacher would be especially effective as a resource to schools considering this type of model. However, she points out that the model would benefit considerably by allowing some access to a computer lab for follow-up work and activities.

Site:	Yost Elementary (Duneland)
Usage Category:	Team Teaching
Site Visit:	January 25, 1990
Field Staff:	Lou Emge

INTRODUCTION

The most significant point about current use is the slow start-up experienced by the project this year. The computers were re-claimed by the state for summer use and returned in disarray before school started. Left on their own to try to get the computers hooked up again, they simply couldn't get all of the problems worked out. It was almost Christmas before hardware was back to last spring's level. This was a very bad beginning for a project which ended last year on a high note and with high expectations.

There was not as much happening this year as might have been hoped. This was due totally to the start-up problems. It seemed that instead of continuing the momentum built last year into a good beginning this year, the teachers experienced frustration with the computer program, were really unable to overcome the hardware setup difficulties, and focused on teaching the way they had previously taught--<u>without computers</u>. They were beginning to get things going again by the middle of January, but this year was in many ways like a first-year project.

The 12 Apples are located in a room between the two fourth grade classrooms, a room accessible to each classroom without going out into the hall. The computers are only used for a total of about one and one-half hours per day, which seems like under-utilization. It would seem that the district-wide emphasis on carefully covering the entire curriculum has kept the teachers from expanding computer time beyond a minimal amount. The usage category appears to call for a total of two hours per day--30 minutes each of science and social studies, and 60 minutes of word processing/keyboarding.

The slow beginning this year is reminiscent of last year, but in some ways even worse. They are taking up where they left off last spring to some extent but were having to "undo" a lot of non-computer things that they got used to doing earlier this year, things they would not have started if computers were available from day one. They seemed betrayed in a way by the computer project because the computers became unavailable at a crucial time in order to keep last year's momentum going.

One of the things that was hoped for last spring was that the two teachers would be given special permission to follow the district curriculum a little less stringently to allow for more creative uses of the computer. This did not work out, so they

are working within the same time constraints as last year. This fact may be the cause for the apparent under-utilization.

FINDINGS

Observation:

The two teachers continued to be enthusiastic about using the computers. The students were proud of the printouts they were generating from the database of states. When back in the regular classroom, they showed the evaluator other state-specific materials they had generated and printed from the database of states. They were eager to share information, and this use of the computer definitely used the power of the computer to give students access to information that would be virtually impossible to glean from books.

Teachers:

Both teachers seemed to lack the real keen spirit of "adventure" in using the computer that was apparent last spring. The slow start this year dampened their spirits and forced them to go back to old ways of doing things to some extent. The principal observed, however, that these two teachers are doing things in their regular classroom teaching that they had not done before the computer project, and things that other teachers do not do. So it has had a real positive effect on the teachers, despite the problems. Given a broader context, it is likely that this project could be viewed much more positively; it is simply that these teachers and the evaluator as well were expecting more at this point this year.

The principal is impressed with the way the computer project has raised the interest of the entire school staff in using computers. A recent district-wide inservice on video disc and modem use had about one to four teachers per school attending. Yost had 12 teachers voluntarily attend.

In looking back at benefits to the teachers because of involvement in the project last year, both felt is has helped them professionally, particularly in being able to interact with all of the technology uses in education. They also said it has made them more willing to try new things. One teacher reported doing a lot more cooperative group work in her regular teaching as a result of the project. The other teacher reported that there has been little change in her teaching. The principal feels that both teachers have become better classroom teachers because of the project.

Students are quite advanced in knowing word processing and doing more meaningful process writing. One teacher also feels

the students have more confidence in pushing ahead and trying to figure things out on their own when they are stuck.

Both teachers are using software related to science, health, and social studies as well as keyboarding, word processing, and process writing. Both teachers are aware of and attempting to implement the usage category. The objective they both feel will not be met is the one related to improving their effectiveness through use of utility software. This is a lower priority compared to the other objectives directly related to the students.

Both teachers expressed interest in learning how to use the modem, which they will probably have accomplished by the spring visit. One teacher would like to provide a summer computer program for other fourth graders, ones not involved in the project. This goal certainly shows that she sees the worth of the project to her students.

When asked about changes in student achievement and attitudes, one teacher reported that she had done an informal survey. Two students didn't like using the computer, five were "lukewarm," and the rest "gung ho". The other teacher observed that students are more willing to work together cooperatively and to settle differences on their own. She also feels her students like to come to school more because of computers.

The computer training provided by the state was not memorable as reported by one teacher and not useful as reported by the other.

Students:

Students were working in pairs on generating database printouts of specific information about selected states. In interviewing students, it was discovered that using the database on the 50 states was very popular. One student liked using the mouse, while another observed that the mouse was very difficult to use. Choosing how something is printed was also mentioned as something they like. They have not written stories yet, but the teachers said they would start any time as their keyboarding and word processing skills are getting up to speed after the slow start. Students liked the idea of striking keys rather than using paper and pencil.

Students work in pairs almost exclusively but will be working more individually, when process writing starts in earnest. One of the classes, and perhaps both, work with a specific partner for about a month before switching. Students said they like to work in pairs because they can get help from their partner when they are stuck.

SUMMARY

This project has the potential to continue to grow and improve, even though to date it has been slower than anticipated. The principal is very knowledgeable and supportive which will help to keep things rolling. If the teachers have the confidence that the hardware will be in the room, set up, and ready to go on the first day of school next year, they will be able to make some giant strides. They really lost that momentum this year because of the hardware problems in the fall.

One area that should be addressed is the amount of time allocated for computer use--about one and one-half hours per day. The room with the computers is unused all morning. Granted, there is pressure to cover the basic curriculum, which limits time away from this curriculum, but perhaps they could integrate computer use into other times of the day and use the computers to complement the curriculum. It might also be reasonable for other classes and teachers to use the computers, rather than let them stand idle, particularly using things the two project teachers have learned. This would make better use of a considerable financial investment. Efficiency has not been a goal to this point, since the computers were furnished by the state and the use rather narrowly defined by the usage category.

Site:	**Yost Elementary (Duneland)**
Usage Category:	**Team Teaching**
Site Visit:	**May 7, 1990**
Field Staff:	**Lou Emge**

INTRODUCTION

Current use is about the same as at the first visit. The length of time the computers are used with students, only 30 minutes/day rather than the 120 minutes recommended in last year's usage category description, is the only variance from implementation of the usage category as described. Subject areas are confined to science, social studies, and writing.

The specific time recommendations of 30 minutes each for science and social studies and 60 minutes for word processing are part of the 1988-89 description of Team Teaching, but not of the 89-90 description. It is assumed that there is still the expectation that students will spend about two hours using the computers each day. The two teachers reported that students only spend about 30 minutes per day at the computer. There was apparently more of a day-to-day or week-to-week alternating of the subject areas, rather than trying to include some of all three each day.

The teachers viewed the limited time the computers were being used as a reality of their situation. Their situation includes three key factors:

1. a very short school day;
2. a very strict time allotment per subject area; and,
3. no flexibility in deviating from the district curriculum.

The teachers were constrained by the three factors above, as well as by the usage category subject area restrictions. They felt they could have made much more use of the computers if they could have utilized them for mathematics and reading. (One teacher said that their Heath reading series has good programs.)

Even with the limited time computers are used, there are quality activities taking place, and the teachers have a vision of computer capabilities for their classrooms far beyond what they have been able to implement to date. One teacher talked about having just learned about Hypercard technology for the Apple IIGS and being excited about the possibilities of this as well as laser technology.

As stated in the first-round report, the momentum built at the end of year one was interrupted, and almost nullified, by the hardware problems at the beginning of the year. The problems

were due to the picking up, then dropping off (literally in some cases) of the computers over the summer for another state project. Both teachers exhibited more enthusiasm during the second visit.

FINDINGS

Observation:

At the time of the visit, one of the teachers had her students working on a variety of activities and software to demonstrate what they had been doing. This included generating crossword puzzles for science and social studies, filling in missing letters in words, and locating numbers in a matrix. They were good thinking activities that related to the subject areas of the curriculum.
The other teacher's regular classroom activity was, of course, non-computer. Students were working in pairs on a common assignment for science. It seemed to the evaluator that the computer project could be given credit for this somewhat different way of doing things in the classroom, but the teacher said it was primarily motivated by district inservice on cooperative learning. It still seems, however, that the computer project has opened this teacher's receptivity to such ideas as cooperative learning. From conversation, observation, and principal's comments, there have been positive changes in her classroom teaching.

Teacher Interviews:

Neither teacher got into much utility software, one of the objectives of the usage category. One of the teachers said she will be using grade report software next year. They felt their priority was computer uses directly related to student use. The other objectives of the usage category they felt they were meeting to various degrees.

Each teacher was asked about personal goals for the year at the January visit. Both teachers mentioned learning to use the modem as a goal. They reported having accomplished this goal to some degree (in communicating with Chris Franklin only). As with feedback from teachers at other project sites, the modem did not seem like a good use of time (not enough benefit for the time spent in learning, overcoming technical problems, etc.) at this point in their computer project development. One of the teachers learned "Print Shop" and used it with her students as a way of meeting her goal of learning available software. To the evaluator, the goal set by a teacher that was the most significant was to start a fourth grade summer school computer program for students from other schools in the district, students who did not participate in the regular year program. She

recognized the benefits for project students and felt strongly enough about its importance for all students to take the initiative. She was successful in this, and the two teachers will be teaching the summer project. This seems to be a notable accomplishment for a teacher who two years ago had limited knowledge of computers and little understanding of classroom uses. Now she is having a district-wide impact in a fairly large school district.

A goal for the students set by one of the teachers was that students would compose at the computer. She feels they accomplished this which is also an objective of the usage category. An area where they felt particularly hampered by their early-year hardware problems was in giving students sufficient time to learn keyboarding and word processing. However, they both felt good about what many of their students had accomplished in this area. Projects, using "Multi-Scribe," included a state report, letter, thank-you note, and preparation for doing reports on animals. Their process writing steps included: create; print; edit/revise; rewrite; and, reprint. They felt that students were much more willing and able to revise written work using the computer.

The two teachers feel students are better problem solvers, but not necessarily in a mathematics context. They feel students are better able to stick to problems and don't give up as easily.

Students:

Computer activities that students particularly liked were making crossword puzzles, science software, a "cloze" activity, and Indiana History. One student reported liking all the computer activities. As reported by teachers, they did not get into writing a great deal. When asked about how many stories they had written, they generally could not respond to this because their limited writing was not of a story nature. All three mentioned the state report (using the state database that was described in the January report), which was a major project. Other writings were a note to their mothers and a thank-you note to a ranger after a field trip. Pairs of students wrote a single thank you using paired, alternating writing.

When asked about what makes computers fun, all three students had different responses. One said high scores on Indiana History and playing games. Another student talked about the keyboard and typing aspect of computer use. The third talked about "Print Shop" and making a banner. Using the mouse was reported as a general difficulty in using the computer.

It was evident from the students' reported computer activities that the usage category was strictly adhered to. Things the students learned with computers that they are most

proud of were writing and printing something (two students) and using the mouse.

When asked about how they would use the computers if they were the teacher, the students did not suggest anything significantly different from what they are doing. One student said they would come in twice a day, rather than once a day.

SUMMARY

The project overcame a slow start-up to make significant gains in integrating computer use into social studies, science, and writing. The project had a positive impact on students, computer use in the school, and computer use in the district. A real strength of the project was that the two teachers worked well together and provided mutual support in all of the extra time and effort that is required in starting such a project. This usage category--Team Teaching--was the most elusive to this evaluator, but in this case, the teachers' teaming (not in actual teaching) was a key to success. The principal and district were very supportive which is important in sustaining the kind of effort to keep the project growing.

The greatest success of the project to this point has not necessarily been realized by the 50 or so students who were in the project each year because of the limited time students spend using the computers. The greatest success seems, rather, to have been in opening up the teachers' minds to better ways for children to learn and motivating the teachers to grow as professionals. As mentioned, one of the teachers is excited about Hypercard technology for the Apple IIGS and laser technology as well. They have a vision (in many cases not yet implemented) of what computers can do in the classroom. This has spilled over to the school and district. The excellent attendance by Yost school's staff at district computer inservice and the starting of a district-wide fourth grade summer computer class is evidence of this.

The biggest area of concern is the limited amount of time that the computers were used. The two teachers seem to accept this as a reality of their situation, constraints of the usage category, and constraints of the school district. For this project to have any chance of exportability or replicability, it would have to be redesigned to make maximum use of the large hardware and software investment.

There are several conclusions that can be drawn from comments the teachers made about recommendations for the future. First, if classroom instruction is to utilize computers as a valuable instructional tool, the school district and school must recognize that teachers using these new tools will need to be allowed maximum flexibility in their instructional program. To

try to use computers strictly within the context of a rigid curriculum and rigid time allocations does not lend itself to effectively utilizing them as an important part of instruction and student learning. A school district expanding the use of computers as instructional tools needs to encourage innovation. Allowing flexibility by schools and teachers sets the tone for innovation.

Second, confining computer use to a particular subject area(s) puts an artificial constraint on using the power of the computer. Computers should be viewed as a tool for learning, and the use of computers can do much to demonstrate the interrelatedness among subject areas. Word processing can be applied to many subjects. Databases and spreadsheets also have many applications. Teachers using computers for instruction should be encouraged to use the power of the computer wherever and however it fits into their instructional scheme. The hardware and software available will necessarily be limiting factors, but artificial subject area limitations should not be imposed.

Evaluator's note:

In conclusion, the evaluator offers a description of what the computer project might look like if it utilized the strengths of the last two years and overcame hindrances.

At least two teachers from the same grade-level in the same building would be involved in the project. They would form a team that would allow for the possibility of finding instructional, rather than just single classroom, solutions and strategies. They could pool their particular areas of interest and expertise and thus overcome the loneliness of change (Educational Leadership, May 1990, pp. 20-22).

At least three, and probably four, classrooms would share the twelve, centrally located computers. Additionally, a computer for each teacher would be provided at home and one in each classroom with an LCD projector.

Classrooms would have an average of 60 minutes minimally of computer time each day to be scheduled flexibly to allow for twice a day, half day, and other schedules to meet the varying needs. Four classrooms could utilize the computers in this way. There would be allowances for flexibility of curriculum coverage and subject time allotments. Computer use would not be limited to specific subject areas or topics. The computer would be viewed as an instructional tool that can be used throughout the total curriculum and can help build connections between and among subject areas.

Keyboarding/word processing, databases, and spreadsheet would be taught within the context of subject areas--but with the idea of using knowledge of these basic computer uses throughout the curriculum.

Site:	**Happy Hollow Elementary (West Lafayette)**
Usage Category:	**Team Teaching**
Site Visit:	**January 10, 1990**
Field Staff:	**Sheila Short**

INTRODUCTION

Happy Hollow is located in West Lafayette and, generally speaking, has the demographic profile that one might expect of an elementary school in a university community. Many of Happy Hollow's students' parents are university professors or graduate students, and many of the project students have computers in their homes.

The fourth grade team-teaching project at Happy Hollow is in its second year of implementation with the same project staff. The two teachers involved in the project do not team to teach any of the lessons but do meet frequently to share experiences and plan future instructional use of the computer. The project objectives for this usage category are as follows:

- to assist the student in planning for individualized learning tasks in science, social studies, and writing;
- to coordinate lab software with science and social studies curriculum;
- to improve teacher effectiveness through use of utility software;
- to provide instruction and practice in keyboarding followed by word processing and process writing;
- to implement special classroom techniques to complement a 4:1 student to computer ratio.

The computers are housed in a classroom that serves as a computer lab for the project, with both classes sharing its use. There are computers in other classrooms at Happy Hollow, so this project is not the students' or teachers' introduction to computers. Many of the fourth graders began the project with some keyboarding skills.

The project got off to a somewhat late start last year but was considered well-managed, despite the fact that it was implemented as a regular computer lab and that the teachers did not team for teaching. At that time, it became apparent that the 4:1 student to computer ratio would not allow the students to develop the keyboarding skills that would be necessary to enhance writing skills. Secondly, the teachers desired to make different uses of the computer. One teacher was very interested in uses of

the spreadsheet and the database for teaching science and other topics. The other teacher had a great interest in using the word processor in each computer and in having her students involved in process writing. She realized for process writing that she must be able to arrange a 1:1 student to computer ratio in the lab. Thirdly, the two teachers began using the computer lab on different schedules. Neither teacher had a regular schedule in the computer lab but used it on an as-needed basis.

FINDINGS

Observation:

Data were collected through student and teacher interviews and a lengthy classroom observation. One of the project teachers was attending a conference the day of the site visit.

On the day of the site visit, the teacher provided an impressive demonstration in the lab using "First Choice," an integrated word processing, spreadsheet, and graphics software package. The teacher had her students involved in a potpourri of computer activities using the one piece of software. There were 13 IBM computers with hard disk drives and three printers set up in the lab. During the visit, 15 students from the project classroom were in the lab. There was a one-on-one ratio on most of the computers; three computers had two students.

First, students accessed an existing file called "Census" out of the spreadsheet program. They had entered census data and switched to the graph program to obtain a visual image of the data. Looking at the graphs that were made, the teacher asked, "Between what years was there the biggest increase in population?" and "Between what years was there the least increase in population?" to assess the students' ability to understand graphs. She demonstrated how well the computer use has been integrated into the curriculum by then asking "Can you think of any reason why that would be? Think about what was happening in the country at that time." One student responded that many people had died in the war, that the country was just getting started, etc. From that response, the teacher asked, "Have you ever heard of the term 'baby boomers'?" A few students responded that it was a movie (and the teacher agreed). Another student responded that it was something that occurred in the 1950s.

The class discussed the term for a little while longer and decided that the "baby boom years" came when soldiers came home from the war, and a lot of children were born nine or ten months later. The project teacher then turned the discussion back to the graphs and asked, "What kind of graph do we have now? Let's change it to a trend graph." She then explained that a trend was a tendency or an estimation of where something is going. She asked the students, "What does trend show might be the average

population for 1990?" One student said, "250 million or a little higher." She then began to teach about census studies and trends for population and other demographics using the computer.

Next, the teacher had students get an existing file from an Indiana History database. She reviewed some information with the students about the 92 counties in Indiana. She explained that the database is like a file cabinet that contains a file drawer. She told them that if you pulled out the Indiana county file drawer, one would find 92 files in the drawer, each containing the county name, county population, county population rank, the year it became a county, county seat, county square miles, and county area rank. She told the students to go to the field that said "county population" and use the appropriate function key to search for a county population that is greater than 250,000.

The students also demonstrated "L.W.Paint," a program similar to "Mac Paint/Draw". Students were quite excited about the possibilities that this program posed for them. The students experimented with the various options and then drew pictures of the state of Indiana.

Last, the teacher had the students design business cards, using made up credentials, that would help them sell Valentine's Day cards and gifts. Students really seemed to have a lot of fun with this assignment because they could use their creativity to figure out what they could and could not do.

Teacher:

The teacher began this second year with the personal goals: (1) to learn more about multimedia, and (2) to develop more computer activities that could be used across the curriculum. Looking for ways and opportunities to use the computer for instructional activities was one of the guiding principles that she tried to live by this year. She saw the two biggest benefits she received for her involvement with the project was an increase in her knowledge base regarding technology and an increase in the number of opportunities she had to attend different workshops and training seminars. Specifically mentioned as valuable were the workshops on using Linkway, problem solving, and telecommunications.

The computer is used to teach science, social studies and writing. "First Choice" is used extensively as is some problem-solving software, such as "Factory" and "Missing Links". These latter two are thought to be most enjoyable to the students. "Factory" is a piece of problem-solving software in which students see a product and then must design machinery that will make that product. The day of the site visit, the students demonstrated the use of "Factory". Students worked in pairs and challenged one another, the teacher, and the evaluator to create

the products. Much discussion was generated among students trying to figure out how to reproduce the different designs and patterns.

The teacher felt the computers had motivated some of her students--especially in the area of writing. She saw that they weren't as reluctant to write as they had been at the very beginning of the year. Students were eager to identify ways to use the computer for instruction and for learning and to take a more active role in their own learning.

Students:

Three students were interviewed from one of the project classrooms during the site visit. While two of the three have computers in their homes, and all had access to a computer in their third grade classrooms, they all reported that they are using computers a lot more this year compared to last year. When asked what they really enjoyed doing on the computer, one student said she liked using "First Choice" because of its versatility. "You can write a report or you can make a spreadsheet or database." The other two students said that they enjoyed using "L.W. Paint" and one added that he also liked using the Indiana History database to find out information on the different counties.

Two students thought that learning the keyboard and the different commands was the most difficult thing about the computer. One student expressed it by saying, "If you touch a wrong key, then it really messes you up. You can't erase it like you can when you write something on paper." Students were also mixed in their responses regarding work preferences with other students or alone. One student said that sometimes he liked working with other students and sometimes he liked working by himself, but it depended on what the activity was. He stated, "For the things that are hard, I like to have a partner."

SUMMARY

The fourth grade team teaching project at Happy Hollow Elementary School has gotten off to a good start. During this first site visit, teachers and students are already quite far beyond what one would expect to find at this point in the school year. Students are quite conversant on the many uses of spreadsheets, databases and other applications. According to the teacher, students have begun to identify new ways to use the computer for instruction and are taking a more active role in their learning.

While the project has been implemented as a permanent computer lab instead of a team teaching site, teachers do team for sharing and planning and have been quite successful in

developing instructional activities using the computer to teach science, social studies, and writing.

Site:	**Happy Hollow Elementary (West Lafayette)**
Usage Category:	**Team Teaching**
Site Visit:	**May 22, 1990**
Field Staff:	**Sheila Short**

INTRODUCTION

The two teachers have implemented this fourth grade project so that they are teaming for planning and preparation but do not team for teaching the content areas. The 13 IBM computers are located in a room across the hall from the teachers' classrooms with the configuration of a computer lab. With the close proximity of the lab, neither of the teachers adheres to a strict schedule, but they let the instruction determine the need for the computer. They don't intentionally plan to use the computer every other day for 30 minutes, but if the teacher is teaching a unit on planets and the computers can be used to set up a database on planets then that's what they do.

Both teachers are using the computer for instruction in the following areas:

- word Processing for writing poems, stories, letters, book reports, science reports, etc.
- developing and searching databases in health, science, and social studies;
- creating spreadsheets and graphs of data collected;
- telecommunications used to contact the Earthquake Center, NASA, and "Classmate";
- problem-solving software such as "Factory," "Super Factory," "King's Rule," and "Incredible Lab";
- developing research and study skills with Almanac and Thesaurus.

Teachers:

When asked about organizational patterns used in the lab, the teachers indicated that they used mostly whole class with some small group and one to one. One teacher felt that the whole class was the most effective organizational pattern to use to introduce or demonstrate an activity. The other felt that for some types of computer activity, like problem solving, students worked better in pairs or in small groups, and for others, whole class was most effective. So the most effective organizational pattern would depend to a large extent on the type of activity.

The teachers mentioned word processing as an example of a computer activity that would work best with a 1:1 ratio.

Regarding cooperative learning activities, teachers felt that students worked well together on some of the problem-solving activities. Students certainly agreed and indicated that they liked working with other students on games like "Factory" and "Super Factory" because they could rely on each other to figure out what to do next and how to solve the problem. But some students complained that on other activities, it could get pretty boring when one student controlled the keyboard, and the other students just sat and watched and occasionally gave input on what needed to be done.

Specific examples of attitudinal changes in students that were observed as a result of increased computer use were mentioned by the teachers. Several students were reluctant to write poems, stories, etc. at the beginning of the school year but really enjoy doing it now because of the ease of writing using the word processor. Many students are conscious of world news and events now, when compared to the beginning of the school year because of the places and events that were studied through computer activities. For example, several students came in recently to report what they had seen on the news about an earthquake and wanted to contact the Earthquake Center to ask some specific questions. Students can earn free time to do any number of things, but both teachers reported that most use earned free time to have more time on the computer.

Teachers indicate that their students have learned to listen and follow directions carefully during computer lessons, so they don't get behind. They also work more quickly because they know they have a limited amount of time in the lab. Teachers noticed that the children in general, but the poor writers and spellers in particular, take great pride in their writings which are printed out. Creativity in writing has improved with students' increased desire to write, according to one of the teachers. The ability to solve problems has improved--especially when a lower-achieving student is paired with a higher-achieving student.

In regard to writing, one teacher indicated that her students have been involved in composing at the computer (more recently), but often students enter handwritten materials on the computer. They usually compose in the classroom and then go to the lab to save time. Earlier in the year, students weren't comfortable going to the lab to create stories, but they are a lot better at it now.

When asked about using the modem, one teacher indicated that it hadn't been used on a regular basis because the phone line hadn't been installed until the end of January. Thanks to their computer consultant, the teachers and students are now using it

on a fairly regular basis. Both teachers reported that their students call the Earthquake Center every few weeks and have plotted earthquakes on a world map. They've also called NASA and gotten answers to their questions about space and space exploration. In April, they got a subscription to "Classmate"and have done several online searches. Students in one class had just completed a search on "Dialog" for any articles on model rocket safety. They plan to do more on-line searches next year for research purposes than they did this year. The computer consultant created a fictitious character named "Mark Stevens" who communicated with the students via the modem. The consultant would send messages to the students and pretend to be traveling to some faraway place. One of the teachers reported that her students became quite excited and wanted to track Mark's travels using the atlas. The students sent messages to their pretend friend and asked him to visit landmarks near where he was traveling. This electronic correspondence continues between the students and "Mark". In fact, one teacher stated that her students became quite concerned once, when they hadn't heard from "Mark" in a couple of weeks and left several messages for him to call and let them know that he had arrived at his next destination safely. She said she became quite amused when "Mark" responded to the students' messages to call the next day when the computer consultant was in the lab!

Teachers found it difficult to estimate how much time that their students spend using the computer lab because the amount of time and the frequency of their visits are dependent on the lesson that they are doing. One teacher thought that, on the average, they used it about two to three hours per week. The other teacher said that they might get into a unit that requires some computer use every day, until the activity is completed. She also felt that it was interesting that the students were now indicating which instructional activities could be completed more efficiently by using the computers. The teachers don't have a schedule that they adhere to, since they are the only two classrooms using the lab, but when they meet to plan some of the computer activities, they discuss times when they might be using the lab. When the occasional unscheduled need for the computers arises, there's usually not a conflict over the lab.

One teacher thought that the lab setting with one computer for each child was ideal. She felt very comfortable with the IBM PS/2 models and thought having the large screen TV for demonstration was nice, but really wanted to have an LCD. To have an effective project using the IBMs, she felt certain pieces of software were absolutely essential. She mentioned the integrated word processing programs ("PFS:First Choice") and"First Publisher" for desktop publishing, "Fanta Vision" and "Linkway" (also for creating stories, reports, and illustrations), "Science Toolkit," "Carmen Sandiego," Tom Snyder "Timeliner" and "Decision-Making" and "Problem-Solving" programs as the most important ones to have.

The teachers' experiences with the project and the philosophy of the corporation regarding computer use have made them firm believers that computers can be effectively integrated into all subject areas and instruction. The evaluator believes that this attitude on the part of the teachers is largely attributable to the support provided them by their computer consultants.

Mike Rush is one of two consultants employed by In-Tech Consulting Company who has been contracted by the West Lafayette School Corporation to provide services to the elementary and junior high schools during the school year. These two consultants provide about one hundred days of service to the corporation and have worked with West Lafayette for four years. Mr. Rush has worked with the fourth grade classes including the two project classes. He indicated that his work basically falls into two major areas: (1) assisting with software selection, and (2) training teachers. In regard to training, Mr. Rush indicated that he generally allows the teachers to decide when they want to introduce a particular software package to her class or do a particular computer activity. Then, rather than tell the teacher how to do it, he models how a lesson is taught using that software with the class with the teacher in the role of facilitator.

Mr. Rush emphasizes integrating computer use into the existing curriculum as opposed to changing the curriculum to fit the available software. He stated that "anything you do with the computer should support the existing curriculum" and "what occurs in the lab cannot be separate from what's going on in the classroom." Mr. Rush has worked extensively with the fourth grade project students in the area of telecommunications--going far beyond an introductory level. As previously mentioned, the project students have communicated with both NASA and the National Earthquake Center. He has tried to get students to understand that we live in a multimedia world and that there are multiple ways available to us to present and retrieve information that is both efficient and effective.

Mr. Rush has worked with the two project teachers to learn word processing, databases, spreadsheets, and telecommunications. His goals for the fourth grade students are very much compatible with the goals of the fourth grade project. He wants to promote proactive thinking regarding technology, student level decision making, and cooperative learning. He would like students to be able to take more control of their learning and make wise decisions regarding the options that are available through technology. Mr. Rush is a visionary.

As mentioned previously, the teachers feel that all subjects can be taught using computers. If the teachers had total control of designing and implementing the project, they would start the beginning of the year by teaching keyboarding for fifteen minutes a day until all students were familiar with the keyboard and basic commands. At about the same time, they would also introduce the word processing program and start having students write short poems, letters and stories. After that, they would introduce graphing, spreadsheets, and databases along with on-line database searching and problem-solving software. The other software programs would be introduced and used when appropriate or needed to integrate with work they are doing in the classroom in all subject areas.

Students:

The five students interviewed during the spring visit indicated that they used the computer a lot more this year compared to last year. The teachers reported that about half their students have computers in their homes. When students were asked about the computer activity that they liked best, there was no typical response. Responses included: "Factory," "Super Factory," word processing, making spreadsheets and graphs, and using the modem.

When students were asked how many stories they had written this year, the responses ranged from 10 to 30. Students indicated that they typically wrote their stories on paper first before going to the lab and then word processed them to do easy editing and revisions. In addition to stories, one student mentioned writing a Christmas poem and writing an article about the "Mom of the Year" that they used with a Time magazine cover and a picture of their moms.

Two students couldn't think of anything that they really wanted to learn or do on the computer that they hadn't done yet. One student mentioned that she would like to learn to make a newspaper. Another student said that his teacher showed him how to animate pictures, and he'd like to try it. The fifth student indicated that he'd like to learn to set up the mouse and use it to draw pictures.

The responses that students made when asked what made using the computer for learning fun were quite interesting. Answers were: "It doesn't look as boring as a piece of paper;" "The games you can play are pretty fun;" "It doesn't get mad at you if you make a mistake or give a wrong answer;" "You can think of it as a typewriter that shows pictures;" and "It's fun because it's not like writing with your pencil, and your hand gets tired."

Students couldn't really think of anything difficult about using the computer, although they did mention things like, "It's

a little hard in the beginning but not when you get used to it," and "There are errors occasionally on the computer, and that's a problem, but it doesn't happen very often."

When students were asked about using the computer alone or with other students, they reported that they do both. Two students indicated that they preferred to work with other students because "you can challenge them to do things with you" and because "if they do something wrong, they can help you out or if they do something wrong, you can correct them." The other students had no preference because it would depend on who their partner was or what the activity was.

Students were asked to tell about the one thing that they learned to do on the computer that they were the most proud of. One student mentioned learning to use the modem; another mentioned that "learning to make graphs was a neat experience." Two students mentioned a rat study that they had done as a class where they had created a nutrition database.

Responses to the question regarding the ideal computers-in-the-classroom scenario were somewhat practical rather than creative. One student realized right away that he would probably need a substitute teacher to take over his classroom responsibilities, while he set up the lab. Three students thought that the first thing they would do is to meet with the students involved and find out from them what computer activity they wanted to begin with. One student thought that he'd probably start with math because the computer tells you if you put in a wrong answer and what you need to do to correct it. One student thought that he would put the computers in the middle of the classroom; another thought that he would have the computers right next to the desks in the classroom rather than in another room.

SUMMARY

This has been a very successful site. Students are involved in a variety of activities that clearly demonstrate the potential and versatility of computer use in the classroom. The teachers have been quite successful in integrating computer use with the curriculum, and students have found the experience exciting and interesting. A large part of the credit for the success of this project must be given to the consultant who helped to set an important tone and direction for the project.

Site:	Oldenburg Elementary (Batesville)
Usage Category:	Team Teaching
Site Visit:	January 18, 1990
Field Staff:	Sheila Short

INTRODUCTION

The Oldenburg Elementary School in Oldenburg, Indiana is part of an old German community in southeastern Indiana. The school is in a large two-storied building that is attached to a church. Many visible signs of welcome and warmth are evident as one enters the building.

There are eleven classrooms in this K-6 school, with each having one Apple IIGs. One of the two fourth grade classrooms houses the project equipment. This classroom was arranged to easily accommodate the twelve Apple IIGS computers and extra furniture without crowding. Four long work tables were used to hold the computers, with each holding three computers. Benches, which are pushed under the tables when not in use, are used for seating and are large enough to hold two students and help economize the existing space. Wooden stands that were made by a local community member hold the printers above the computer monitor. Software was neatly stored in individual disk storage boxes that were placed by each computer.

The Oldenburg team-teaching project involves two teachers who work well together planning instructional use of the computers in the areas of science, social studies, and writing. They don't really team teach, but they get together on a regular basis to plan, share and collaborate on instruction and work out any problems they might encounter. One teacher teaches social studies for both classes, and the other teaches science; both teach language (writing).

Last year, with strong support from the principal, they were able to make technology come alive for their students. But there were periods of time when they were frustrated because they didn't know how to do some of the things that they wanted to do with the computer, and they sometimes tried to find assistance external to the project. They are beginning to learn to rely on their own instincts to resolve problems and build their capacity in this area.

The principal continues to be very supportive of the project this year. She is not only as knowledgeable about the project as the teachers, but she also offers sound instructional suggestions on how to use the computer and software effectively.

FINDINGS

Observations:

During the site visit, data were collected through student and teacher interviews and an observation of one of the project classrooms. The day of the onsite visit, a classroom of twenty students worked on an Indiana History activity using "Timeliner" (Tom Snyder Productions). The teacher demonstrated making timelines using both the LCD and textbooks (Living Indiana History). The demonstration centered around involving the students in identifying the events that occurred around the time of the Revolutionary War and creating a timeline of those events. Students were then given an assignment of creating a timeline of events that occurred in Indiana around the time of the Revolutionary War. It was interesting to watch the students select events from old Living Indiana History textbooks, discuss which ones were important enough to include, and re-word the event to fit the amount of space they had to work with. As students worked in pairs on this activity, much discussion occurred about the historical events and what was considered noteworthy.

Teachers:

One of the teachers felt that the project has helped her keep up with technology. It has also given her an extra tool for teaching. She feels that the project has also benefitted her students so that they are not intimidated by technology. When asked if the project helped her students expand their thinking skills, she indicated that for a few students (the sharper ones) using the computer has helped to develop skills like problem solving. She indicated that many of her lower-achieving students think of the computer as a toy, and they like to play games on it. She feels that those students are not really thinking better or any differently. The computer just makes it easier for them to do what they are doing.

Both teachers typically do demonstrations using the LCD for large group instruction and then make assignments that the students do working in pairs at the computers. They feel that using the LCD is much easier and faster than writing on the blackboard, and they frequently use it instead of the blackboard. One teacher described an activity using the LCD to demonstrate a writing lesson using figurative language. Students were asked to write a paragraph about the teacher's garage using figurative language. The teacher reported that the students became excited about it, especially since they got to work in pairs and bounce ideas off each other. The teachers noted that students typically like to work together on these activities, since one can usually figure out what to do if they get stuck and they don't have to ask the teacher so much.

One of the goals that the teachers had set for the project at the beginning of the year was to teach process writing and to help the students become proficient word processors. Both teachers have begun to stress writing with their students and hope to see some growth in this area by the end of the year. They believe that thinking skills will be expanded for most of their students because of the reinforcement of the writing experience, especially by varying the purposes for writing.

Students:

Four students, two from each fourth grade class, were interviewed during this site visit. Not one of the students had a computer at home or access to a computer outside the project. All students reported that they are using the computer a lot more compared to last year. A couple of students stated that in the third grade they usually got to use the computer when only they got their other work done.

Students felt that writing was much easier and a lot more fun with the computer. One student said, "Your hand doesn't wear out when you write. If you make a mistake you don't have to go back and erase it. It's a lot easier. It's fun, but it still is a challenge." Students could not think of anything difficult about using the computer but did identify several things that they wanted to learn using the computer, like how to make labels. Students are quite comfortable talking about the various programs. One student said using "Appleworks" was hard now that he knew "Magic Slate" because he kept getting the two confused.

Responses were mixed when students were asked whether they preferred working with others or alone. One student said, "I like working by myself. But if you make a mistake, it's nice to have someone to help you figure out what to do."

SUMMARY

This project has gotten off to a strong start this year, largely because of some of the experiences that the project staff had the first year of implementation. The teachers know where they want to go with the project this year and how they want to get there. The project is still enjoying strong support from the principal. Students seemed to genuinely enjoy their involvement with the project. For some students, the novelty of having hands-on access to the computer seems to be responsible for a large part of the excitement, but for other students, there seems to be at least some recognition that the computer can be used as a tool to facilitate instruction.

Site:	**Oldenburg Elementary (Batesville)**
Usage Category:	**Team Teaching**
Site Visit:	**May 29, 1990**
Field Staff:	**Sheila Short**

INTRODUCTION

The team teaching fourth grade project at Oldenburg Elementary School was led for the second year by two very excellent teachers who team a great deal for planning and coordination. One teacher taught all the science for both classes, and the other taught social studies. Both teachers teach language. They felt that they worked well together, not only on project activities, but also on other collaborative efforts. One teacher reported, "We bounce things off each other. We have learned to share what we do so that we don't both have to repeat the same experiences. You can cover more ground when you're sharing everything." During the two years of the project, they have used mostly trial and error to learn how to use the various pieces of software most effectively. But even with the experiences and accompanying frustration, both now readily admit that to learn the software, there's really no better approach to use.

From the perspective of the evaluator, both teachers are especially effective instructors in their classrooms. They, along with the principal, possess many of the characteristics that are found in strong educators and have implemented this project in conformity with the project objectives listed below:

- to assist the student in planning for individualized learning tasks in science, social studies, and writing;
- to coordinate lab software with science and social studies curriculum;
- to improve teacher effectiveness through use of utility software;
- to provide instruction and practice in keyboarding followed by word processing and process writing;
- to implement special classroom techniques to complement a 4:1 student-to-computer ratio.

After reflecting on the two years that both teachers have been involved with the project, one indicated that the first year they used whatever software was available. They, along with the principal, spent considerable time the first year trying to identify potentially useful software, reviewing it, and working

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through problems getting set up. As mentioned previously, much of the learning regarding the project was by trial and error. Not having much formal training with computers, they found it difficult to learn everything they needed to know. On their own initiative, they attended workshops (after school) in the area but felt that these workshops were geared toward the "computer illiterate," rather than computer users.

By the second year, they had learned to allow the lesson or the instruction to generate the activity on the computer. Both teachers agree that they have learned to approach a lesson using the computer with a specific plan but have also learned to be flexible.

The changes from last year to this year are most noticeable and most significant with the project teachers. They have grown and developed some important insights about the project. They are no longer on the great search for the perfect software; they are no longer in desperate need of outside experts and resources to solve their problems and to build/expand their knowledge base. They now realize that they hold the key to the success or failure of the project within themselves. And they seem confident and empowered to be able to do bigger and better things next year. Each year they have added considerably to their knowledge and experiential base, so that they now seem to know where they are going and have set a definite course to get there.

This year's project students, in many ways, seem much like last year's fourth graders. They display excitement and enthusiasm about working on the computers. Yet, they still seem to maintain an attitude that says they are used to having computers around the classroom--just like textbooks and other instructional tools.

FINDINGS

Observation:

Data were collected during the spring site visit through teacher, principal and student interviews. The time of day in which the site visit (late in the afternoon) was made did not coincide with a computer activity. The teachers and principal were interviewed as a group after school, and one teacher was interviewed for additional information individually.

Teachers:

The two project teachers are very compatible and work well together. They do not specifically team teach at any time, but they team on a daily basis to plan and collaborate on lessons and instruction. One teacher teaches the science for both classes,

and the other teaches the social studies; they both teach language (writing). They believe in order to be successful with the project that one must be a good teacher to begin with, be organized but flexible, and be willing to take some risks and make some mistakes. They discovered during the latter part of the first year, after spending much time and effort previewing an enormous amount of software, that there's not much good software available in the content areas. Last year they used mostly what was available and were not satisfied with the quality. This year they used the strategy of first deciding what they wanted to accomplish in both the science and social studies curricula and then figuring out how the computer could be used to do what they needed to do.

Large group instruction using the LCD for demonstrations to introduce a lesson or activity before students are paired up to work on the computer is the predominant approach that the teachers use. Teachers mentioned that they had students involved in much more process writing this year, compared to last year's group. Students used the computer to write for a specific purpose, sometimes writing descriptive pieces and other times writing persuasive pieces. The teachers encourage students to organize themselves for writing through notes and outlines before sitting down at the computer. One teacher noticed that the students seemed to be "more fired up for writing than they were at the beginning of the year." The principal also mentioned that she had also observed this change in her son who is a project student.

The teachers feel that they ran out of time to do some of the things that they wanted to do with the project this year. For example, they only used the modem twice this year, but next year they want to communicate with other schools on a regular basis.

Both teachers expressed concern about follow-up to the project for their students next year and felt that the project should be expanded upward (to fifth grade) to facilitate continued growth and development for the students in the area of technology.

<u>Students</u>:

It was interesting to note that students display both excitement and matter-of-factness when talking about being involved with the project and having access to the computers on a regular basis. Not one of the three students interviewed had a computer at home or access to a computer outside the project. They all indicated that they are using the computer a lot more this year compared to last year.

Students reported that they did quite a bit of writing this year using the computer. They wrote letters to their pen pals, Evan Bayh, and Joe Montana and have written various paragraphs, stories and reports as well. One student indicated that he liked using the computer for writing because "it's not as much work as using a pencil. You just erase it if you make a mistake."

Students did not find it easy to think of anything difficult about using the computer. One student said, "It's easy to use, and it doesn't make you feel stupid when you do something wrong." All students indicated that when they work on the computer that they most often work with other students, while two of the three stated that they preferred to work with others because they could accomplish more working together than they could by themselves.

SUMMARY

At the conclusion of the second year of project implementation, there was strong evidence that the Oldenburg team teaching site was well organized and managed, and implemented in accordance with the project objectives. The two strengths involving the project staff noted at the end of the first year are still in evidence this year and should be reiterated along with an additional one:

- The principal is still providing strong support to the project. She is an effective instructional leader who has encouraged and supported the project teachers in their efforts to integrate technology into the curriculum. At the beginning of the project, she was largely instrumental in finding an ideal arrangement to accommodate the computers in the classroom, assisted staff in locating and reviewing software, and offered many valuable instructional suggestions on how to use the software.

- The two project teachers make a strong team and are especially effective with the computers. They do not team teach at any time, but they plan, share and collaborate with each other on a regular basis. Their shared experiences serve to provide an additional resource when one wants to try something but is not sure how to go about it. They have made the students understand the role of technology in the classroom and in today's world.

- In terms of project implementation and management, the teachers have also learned to not be dependent on external resources and experts for the direction set for the project. This was a valuable lesson that they learned because at the end of last year and the

beginning of this year, the project teachers were at times frustrated when their attempts to find out more about using the hardware and software from outside sources led to disappointment. The philosophy that they have acquired and live by is that the best way to discover how to use a piece of software most effectively is to personally try it out and to learn from those experiences.

These teachers (and principal) would be an excellent resource to other team teaching sites and staff and should be invited to share their experiences with other sites considering the implementation of this usage category. The Oldenburg teachers have gained some insights about the project and technology during the past two years that would be beneficial to instructional staff wanting to learn how to integrate the computer into the curriculum.

CAI MINI-LAB

Site: Eastern Pulaski
Usage Category: CAI Mini-Lab
Site Visits: February 21; May 21, 1990
Field Staff: Dr. Beverly Farr

INTRODUCTION

All four teachers at this site are still using the computers with a great deal of enthusiasm. They continue to move the computers on movable tables from one room to the next each day. (The school is "open space" so it is not difficult for them to move them from one area to the other.) The teachers indicate that they would have kept them in one room this year if one had been available, but this was not the case. The fourth grade is departmentalized; each of the four teachers has responsibility for a different subject area. They are providing many of the same computer experiences for students as they did last year, although there seem to have been some clear enhancements in science. The teachers all commented that this year's fourth grade was, in general, more difficult to deal with and less capable than last year's, so much that happened this year was colored by this fact or their perception.

There have been few problems with the hardware, although a consultant from Graham Computer suggested that some minor problems they had might have been a result of moving the computers all the time. It is clear in this site, however, that the presence of the computers in the classroom has resulted in much more curricular integration. When it is a teacher's day to have the computers, they are used with every group that comes in that class all day. The students seemed about equivalent to last year's in terms of their ability to handle the computers and manipulate data.

FINDINGS

Observations:

During the first visit, students were busily working two or three to a computer entering data, using "Microsoft Works," for a survey that they had conducted in the four fourth grades on aspects of their lives: pets, belongings, trips, hobbies, etc. They seemed quite competent managing the data entry process, and there were no problems with off-task behavior. They had problems with the task from time to time, but both the teacher and an aide wandered around the room, providing help as needed.

During the second visit (only a few days before the end of school), the computers were located in the language arts class, and the students were practicing keyboarding skills using a program they were trying out for potential use next year. Keyboarding was not a clear part of this usage category, but the teachers felt a

need to develop student skills in this area to a greater extent, and they were considering giving it more attention next year.

Teachers:

Goals. At the first visit, teachers generally expressed a desire to know more about how the computer works, to extend their skills, make more creative use of spreadsheets and database, and to expand their use of Microsoft Works. By the second visit, one of the teachers felt that they had "met and surpassed" the goals they had set. Another teacher stated: "I feel I have been able to expand the curriculum this year by the use of Microsoft (Works) all year in math. The use of surveys, spreadsheets, and charts have helped me reach my goals." This comment was supported by the classroom observations and discussions with teachers and students. They have made extensive use of the database and spreadsheet functions on "Works," and the students have clearly gained confidence in using them. (One student reported that her family bought a computer for home use as a result of the project, and she is responsible for keeping "inventory" or crop information on a spreadsheet for her father's farm.) Teachers also expressed an interest in incorporating more problem solving activities; they had ordered "Rocky's Boots" for this purpose.

Uses. There seems to have been more use of computers for math applications at this site than at some other sites, although it was definitely not drill and practice-type activities. The students used programs like "Math Mansions" or created their own programs for studying the times tables. There was substantial use of database and spreadsheet activities in math classes. In addition, they had used problem solving to develop economic awareness through budget preparation and conducting cost comparisons.

A major change seemed to take place this year in terms of how extensively the computers were used in science. The teacher had identified many more programs to use and had done a good job of integrating their use with the curriculum, in fact expanding it by offering more experimentation. This was also different from other sites in this category. Students used "Sir Isaac Newton's Games," "Science Toolkit," "Incredible Lab," and "Cardiovascular Lab" to explore science topics. One involved using a probe to test certain hypotheses. They used problem solving techniques and then used physical props to test their ideas. They also conducted research on some inventions.

The teachers had the students complete a database on the 50 states after doing the research in their social studies class. They wrote reports about the research in their language arts class. They also did other word processing, writing stories and questions for a "Jeopardy" tourney. To a limited extent, they used programs on the IBM network for reading and spelling.

In comparison to other sites in this usage category, they seemed to do less drill and practice activities and writing and more database and problem solving activities. According to student responses, they did more word and number games as well as more science and social studies than students in other sites for this usage category.

The teachers found it easiest to use the computers for math and liked the fact that it had become a more prominent part of the usage category this year. They found it most difficult to find software for use in problem solving and for science and social studies, particularly Indiana history.

In general, there were few problems with the hardware, although they indicated they had good support from IBM when there were problems. They did not really add much to their software library but felt that many of the interesting software packages they heard about were not for IBM. Despite this, they really liked the IBMs. They also indicated that they used the modem for communicating with DOE; they expressed the wish that other sites would be more interested in communicating than they appeared to be. According to the teachers, students used the computers more than an hour a day and more than five hours a week.

Effects on teachers. The teachers in this site were all emphatic about how much they had benefited from participating in the project. They expressed the fact that they had learned a lot (particularly about IBM computers which was new to them all) and that it had generally furthered their own education. They also made many comments about the excitement and fun it had added to their teaching. They felt they were no longer "stuck in a rut," that they were teaching more problem solving, rather than strictly by the book. "Looking back," commented one teacher, "I realize how rigidly I stuck to the book; there is more divergent thinking now, and I plan differently." They were generally appreciative of the opportunity to "stay abreast of the world of technology and how it is impacting the education of our students. It has changed, for the better, my teaching strategies."

The responses to the probe regarding changes in their teaching strategies reflected definite and positive changes. They commented on the "integration of subject areas" and the development of a "better awareness of the need for total integration of our curriculum." One teacher mentioned that it had forced her to be better organized. Another stated, "I am more flexible; I can look at a project and try to figure out how to use the computers." These teachers "learned to love working with computers; it is a way to make learning fun for them and me."

Students:

Goals. The teachers had set goals for the students of learning more problem solving, exploring the capabilities of the computer further, and to learn to work together--"think about others, not be so self-involved." The teachers felt that these goals had been accomplished, although they commented that this year's group of fourth graders was very different from last year's. The students this year had considerable more difficulty learning to work together.

Uses. The students reported somewhat more computer use for database, social studies, and science than other sites in this usage category. The use for writing and science appeared to increase somewhat between the first and second visit, according to the students' assessments. They indicated that they liked doing spreadsheets and math, as well as "Oregon Trail" and "Carmen Sandiego" because they "like to investigate, solve problems." Their comments also indicated that they liked the fact that the computer empowers them to do things they could not do with the traditional tools of learning.

These students worked predominantly in small groups, and almost all of them who were interviewed indicated that they preferred working with other students. They stated that this was because they could "combine ideas," "have people to help you if you're stumped," and "it's easier when you have two heads put together so you can figure it out." Only one student indicated that he was used to "getting things done and going on ahead."

Effects on students. When asked about effects on student attitudes, teachers made comments such as the following:

> "They are building self-esteem, finding success."
>
> "They are more cooperative, helping each other; especially good for kids who don't relate well to pencil/paper even when it is the same activity; they are respectful of the computer and more willing to tackle the problem."
>
> "They are more eager to learn, come ready to learn; there are far less behavior problems on computer days."
>
> "Some with poor attitudes will kill to get on the computer, will also work more carefully."
>
> "Students aren't afraid to try; the computer doesn't make fun of them."

In terms of student achievement, the teachers stated that students' writing was better and longer. They felt they had also progressed in problem solving and in solving their problems

together. "They will go to other groups (for help); the teacher is the last resort." Beyond these outcomes, however, the teachers felt they needed some sort of test scores to confirm their feelings that students were achieving more.

SUMMARY

The teachers in this site have maintained the "spirit" of this usage category by moving the computers on portable carts and integrating them with the curricular areas designated by the usage category description. While they scrambled last year to find adequate software, they have done much better this year at focusing on a few packages that have really met their needs. They feel that Microsoft Works is almost all they need, and they have done extensive work with database, spreadsheet, and word processing. They have also integrated use in science and social studies well. Their students work well together, usually in threes. The teachers thought it would be somewhat better if there were enough computers to have two students to each one and if they had more training in the beginning provided by teachers such as themselves who had confronted the challenge of curricular integration. They expressed an interest in providing keyboarding instruction early in the year. Interestingly, the students who were interviewed all thought that keyboarding practice was a good idea but that it should be done in the middle of the year after they had gained some facility with the computer.

The teachers and students in this site have accomplished a great deal with computer use and have maintained a high level of interest and enthusiasm. It appears that these teachers will continue to search for ways to integrate the computers meaningfully with instruction. Although they are somewhat ambivalent because of the difficulty of moving them, they do see that having the computers present in the classroom makes it more likely that they will integrate them with instruction.

Site: Shrum Elementary (Salem)
Usage Category: CAI Mini-Lab
Site Visit: January 18, 1990
Field Staff: Lou Emge

INTRODUCTION

The project currently involves three fourth-grade classrooms, located next to each other. Last year there were two fourth on one floor and two fifth on the other floor, a real problem for moving computers. One of the three teachers involved this year had an extended illness, so her class has used the computer very little. The other two teachers have the computers in their rooms much more than planned in the original category description because of one less teacher involved and one of the remaining teachers absent. They keep the computers for two-week rotations.

There does not appear to be any particular focus or area of computer use that the three teachers have settled on together. They seem to work fairly independently of one another and choose computer software and activities that best meet their particular needs. The objectives and key elements of the usage category do not seem to be considered in the choice of software and activities. Software that teachers understand and that seems to fit into their way of doing things is usually chosen.

The project seems to be moving along as it was last year. The hardware, printing, moving of computers, networking problems experienced last year have been reduced a great deal. There are three teachers this year compared to four last year, so it is only four weeks between a classroom's computer turn.

As last year, there was not much evidence of a real focus or goal or vision for the project. It continues to be a fragmented use of software selected because it has some appeal for teachers or students. Also, there is no real understanding of the usage category and how it relates to what they are doing.

FINDINGS

Teachers:

One of the teachers was on sick leave most of the school year. She had only returned the week of the site visit, so trying to find new and exciting ways of using the computer was understandably not a high priority with her at this time. She enjoyed her involvement in the program last year. The biggest benefits to her students were that they became very willing to experiment with the computers and knew they couldn't break them, and that they discussed things

more in groups. Her day-to-day teaching has been affected by her computer involvement by helping her become a more careful planner and allow for more flexibility in grouping students.

Her goals for the year were to do more cooperative learning, rather than individual student computer use and to be more involved in projects. She wanted her students to learn keyboarding better (not an objective of the usage category) and to learn to work together better. To this end, students have generally worked 1:1 on the computer. She has not had the opportunity to pursue either personal or student goals much yet this year. Again, the goals lack a vision of using the computer as a tool for students to learn better.

With regard to software, this teacher uses a lot of individual math work from the server and also "Teaser" by Tubbs, which is problem solving and good for cooperative learning. She hopes to get students involved in "Writing Assistant". She likes the hardware, but there is too much software to learn about. She also feels there is little science software available, particularly for the network.

The second teacher was a fourth grade teacher in the program last year also. Benefits she received from involvement in the project include the fact that she learned a lot about computers and software. The project has helped her students with problem solving and to produce more polished products when writing (not in usage category). She has started having her students work in groups preparing for when the computers will be back in the room.

Goals this year for her and her students again revolved around "Writing Assistant" and word processing. Presently she does some math, science, and reading. She generally has students work 1:1, with occasional 2:1. They have searched for "Carmen" as a cooperative learning effort, independent of the network. The only impact on student achievement that she mentioned is that they write better using the computer (not an objective for the usage category). She reports she does a lot of writing activities. She has used the computer for demonstration, but only to introduce new software.

This teacher likes the network, but feels there is too much software to learn, and she feels it is overwhelming. The state training was better than last year, but for her was an information overload.

The remaining teacher was a fifth grade teacher in the project last year but moved to fourth grade in a room next to the other two project teachers. In looking back at last year, she said she moved from "point zero" to learning a lot about computers, and it was a different kind of year; she really enjoyed the computers. The biggest benefit to her students was their involvement with thinking

skills and problem solving. She also felt they grew appreciably in the area of computer literacy.

Her goals for this year's computer use is to complete larger projects, such as reports on birds and newspapers. She also hopes to have less textbook instruction. She wants her students to be able to use the computer more independently.

Instructional activities include putting things into a teacher file on the server, more printing, and cooperative groups where students work on a single product for a single grade. She is sometimes allowing students to choose to work either individually or in pairs.

A benefit mentioned by several teachers is that using the computer seems to equalize students of varying abilities. This teacher mentioned a particularly low-achieving student who is adept at printing and is used as a class resource.

Students:

The first student interviewed reported liking English programs and drawing in conjunction with them. She likes computers because they are better than paper and pencil. Practicing spelling words, playing word or number games, practicing math problems is where they had used the computer the most. This is the classroom where the teacher has been absent most of year.

The second student also liked drawing pictures. When asked if they printed them, she reported, "Not usually." This seems to miss the point of writing as communication. It simply becomes an exercise which is "glitzed up" by using the computer as a typewriter and to draw some pictures. This student thinks the computer teaches you better because you can read it yourself, and it's better than a book because you don't have to turn the pages. She liked working in pairs because she and her partner can learn from one another. They practice spelling words a lot and practiced keyboarding a lot early in the year. It is difficult for her to type without peeking at the keys. The teacher does demonstrate to the whole class, but only on using the computer and software.

The last student interviewed talked a lot about math activities--times tables and a game for estimation (a good one in the opinion of the evaluator). This student found the estimation activity difficult, which it would be if done independently and not used as expansion and reinforcement of estimation as a process. He also talked about typing stories on the computer and doing a report on birds. His response to, "What makes learning with the computer fun?" was that it lets you know right away if you get it right or wrong.

SUMMARY

This project has never gained a direction or vision of what could happen or was supposed to happen. The teachers viewed any and all software that they came across as potentially important for their classroom. The criteria seemed to be if the teacher understood it, the students liked it, and it made some sense in the grand scheme of their classrooms, then it should be used. This fact seems to support the point of view that being a good classroom teacher (as these teachers are) does not necessarily provide the wherewithal to plan and implement meaningful computer activities to enhance student learning without specific guidance and systematic, on-going support and nurturing.

Site:	**Shrum Elementary (Salem)**
Usage Category:	**CAI Mini-Lab**
Site Visit:	**May 8, 1990**
Field Staff:	**Lou Emge**

INTRODUCTION

The eight IBM computers are rotated among three fourth grade classrooms at two-week intervals. The IBM's are used both as a network using special IBM curricular materials and some games and other programs and with other software as well. The LCD viewer that was ordered and received was not compatible with the computers. The teachers were very disappointed with this as they looked forward to using it for whole-class demonstration.

The usage category description did little to guide this site toward the objectives stated or into a focused use of the computers for instruction. There was little computer activity that was closely related to the classroom curriculum, except perhaps some writing activities. In working toward the objective relating computer use to math, social studies, and science, the teachers were on a two-year "magic software hunt" to find appropriate math, science, and social studies software. They reported the amount of software they had available to them was overwhelming in that it could not all be reviewed and digested. It is the feeling of this evaluator that they will never find the "magic software" that will match the district curriculum, be at the appropriate level of difficulty, and be available when it is needed in the quantities that are needed. An example of software that would fit these criteria is the Indiana history software, which unfortunately is not available for IBMs.

The objective of enhancing problem solving and higher order thinking skills was one which received a great deal of emphasis. However, this objective was pursued through the rather random use of game-like software, and no connections were made to anything else they were learning and doing. During the last site visit, the evaluator observed students using an excellent estimation activity. It could have been used effectively for introducing and/or reinforcing estimation concepts. Instead, it was simply chosen by students as one of several games they had available at the time--with no introduction, link to mathematics, or follow-up.

Using the computer for writing was reported as a major use by all three teachers. The keyboarding, word processing, and process writing seems to just happen at many of the sites, regardless of whether it is part of the usage category or not. This is not mentioned at all as an objective of the usage category. However, this use apparently made the most sense to the teachers in using the computers to do a better job of teaching students. The

challenge is to design a computer project which helps teachers with other kinds of computer uses--spreadsheets, databases, graphs and charts, integrating different uses into a single project--computer uses that have the flexibility to be applied to different subject areas and grade levels.

The two-week rotation schedule, which was chosen at the beginning of the project last year, seemed much more reasonable than the daily rotation which is used with the Mac Lab at Perry Central. In fact, it was a necessity at Salem last year because two of the rooms were on one floor and two on the other. When comparing how teachers worked together and shared ideas at the two lab sites, Salem and Perry Central, it might be noted that at Salem there was little working together or sharing of ideas. Each teacher, to a great extent, worked in isolation and designed his or her own activities. One factor that might have influenced this result could be that the teachers waited six weeks last year and four weeks this year between computer time. There was not an on-going, imminent need to look for ways to effectively use the computer as there was at Perry Central when they would be rolling them in every week. There are instructional advantages to having the computers for two weeks at a time as well as advantages to having them every week. From these two sites, it could be concluded that the weekly rotation is more effective both in keeping teachers involved and in making the computer a more valued part of day-to-day classroom instruction.

The principal felt that the computer seed planted by the project is growing in his school. An example is that there will be a summer computer program for fourth graders who were not in computer classrooms this year. Next year there will be seven computer rooms rather than the three that are presently served. They are keeping the network with a more powerful server. Also, there will be one computer in each classroom all the time.

FINDINGS

Observation:

The computers were being used in a non-networked fashion with groups of students working on teacher/student selected software. Groups of children were working on "Carmen Sandiego," "Jr. Jeopardy," and cross-number puzzle games. Each activity is a very worthwhile learning activity which could have much more value if presented as an instructional activity with definite reasons for doing them, reasons other than that the children enjoyed doing them.

Teachers:

The teacher whose students were observed had been absent for

several months in the fall due to illness. In May, she was back to full strength, and she talked enthusiastically about her involvement with the computer project. Last winter she had mentioned three personal goals for computer use--to do more cooperative learning, spend less time on individual computer use, and conduct more projects. She reports having done a lot more with cooperative work groups at the computer which also resulted in less individual computer use. She said that she is using more group work in her non-computer instruction as well and gave an example of a joint social studies project. She had involved students in a state report project using the computer which was responding to her third goal. Each student was assigned two different states which they researched. They typed and printed the reports using "Writing Assistant" and printed outlines of the states using "Printing Press". This is a good example of using the computers for learning activities directly related to the curriculum (although word processing is not part of project.)

Some specific activities mentioned by this teacher are as follows: generating a timeline on Indiana History, an excellent example of applying computer capabilities directly to fourth grade social studies, a subject area of the usage category; a math program that generated worksheets in math (20 problems in seconds); writing sentences using spelling words (not a focus of the usage category).

The games and activities described in the observation as well as "National Inspirer," "Concentration," and "Wheel of Fortune," were games the children loved. The teacher mentioned "Carmen Sandiego" in particular as being valuable in learning knowledge of states, vocabulary, etc. She described an activity using the "National Inspirer" program and one computer for the whole class. This showed real progress from her earlier almost exclusive 1:1 computer/student usage. The class divided into five groups and worked at their places as a group while one group was at the computer. She said students were sharing responsibility and felt success and failure as a team.

All three teachers talked about using a computer folder for each child which contained log sheets for IBM-networked programs students had done, charts, and records. Apparently this was started only this spring, and teachers felt it was very beneficial for themselves and the students to know where they had been and where they are going. (This is the kind of thing that could be part of initial training and implementation and not be left to teachers to figure out its value after a year and a half in the project.) It shows teachers moving toward a bigger, interconnected picture of computer use, rather than a day-to-day, random activity approach.

One teacher reported using the computers about an hour/day, and this has been gradually increasing. Apparently when the

computers are in the room for the two weeks, there is a lot of time when they are not being used, at least in this classroom. The other teacher interviewed mentioned two goals last January related to writing. She and her students learned "Writing Assistant" which is demonstrated by their completion of "Birds of the World" reports for Open House. However, they only used the computer to produce the final product, which is understandable considering they spent little or no time learning the keyboard.

This teacher talked about getting away from the networked IBM and using the computers more often as stand-alones. She mentioned "Jr. Jeopardy" from Scholastic as generating excitement and enthusiasm as well as continually learning new information about a wide variety of subjects. From the evaluator's observation, it is not clear how much the students are actually learning.

The teacher reported in a log that "Carmen Sandiego" is an excellent tool for learning more about our country. It was really fun for her to see how the students would dig for answers and work together cooperatively. In another log, she described a math problem-solving program from Sunburst, "Teasers for Tobbs". The children worked in pairs on this. She said children could not jump to answers, really had to think, and had paper and pencil to work out answers as needed. It is a good thinking activity involving addition and multiplication in her particular program.

The third teacher spoke of using a variety of programs including "PFS: First Choice," "Print Shop" and "Printing Press," "Create a Calendar," "National Inspirer," "Logo Writer," "Carmen Sandiego (USA)," "Classic Concentration," "Junior Jeopardy," and things on the network. She used some of these programs as well as "Writing Assistant" for projects, reports, creative writing, and sentence writing. Her logs reflected students using resource books to find information or to explain clues for "Carmen Sandiego". She spoke of the development of her class in working in cooperative groups. She talked of students getting along better, working more effectively with everyone contributing, and getting more work done. She also reported that leadership roles have also changed during the year. When teachers give up some of their role as director of all class activities, it is a great opportunity for students to assume leadership roles.

Two of the teachers said they favored less networking and more stand-alone use of computers. The IBM networked software never did quite meet their needs for math, social studies, and science. The many game-like programs, word processing programs, and picture-generating software that were used were viewed by the teachers as more effective and these were done independent of the network.

Students:

The students interviewed named "English" activities as ones

they liked best. One student described English stories where you read the story on the screen, then answer multiple choice questions. The other liked using "Primary Editor" to draw a picture and write a story. She wrote a six-page story (on her own) but hasn't printed it yet. Neither of these activities is consistent with the usage category.

When asked what makes learning with the computer fun, both students felt writing things and drawing pictures. When asked what they are most proud of, one said "touch typing to see how fast I can type," and the other said "English--writing a story and drawing."

When asked how they would use the computers if they were the teacher, the students said they would use them more--one said half the time and the other said almost every day. Both responded enthusiastically to this question which reflects their enjoyment of the classroom computers. They both mentioned writing stories a lot. One mentioned doing social studies, science and health activities, and another mentioned math. "Logo writer" and drawing pictures were also mentioned as something they would do a lot.

SUMMARY

The teachers and students enjoyed the project and benefited from their involvement in the program. However, there is little that happened that could be considered worthy of replication. There are things to be learned from the project, particularly in comparing and contrasting this IBM Mini-Lab with Perry Central's Mac Mini-Lab.

The rotation of computers was very different--Salem every two weeks and Perry every day. The Perry teachers met weekly and seemed to have more of an on-going, pressing need to develop their classroom computer capabilities. This could in part be due to the computers coming into the classroom much more often. Also, if their weekly meeting produced one new or refined use, this could be immediately put to use in the classroom. It seems that the two-week rotation with four or six weeks between turns leads to complacency about the computers when they are not in the room. "Out of sight, out of mind." Teachers may feel they are more responsible for their own two weeks, rather than considering that they are "all in this together," the attitude more prevalent at Perry. If there were one good computer setup with access to an LCD viewer in each classroom all the time (which Salem will do next year), perhaps the longer rotation schedule would prove to be more effective.

Another factor related to rotation schedule is how computer use is viewed by the teacher and students when computers are not in the classroom. Perry's daily rotation, particularly in the two

fifth-grade classrooms, seemed to produce a computer atmosphere, even when computers were not in the room. Already last year teachers reported that much of what they did with the computers on their computer day each week was planned as a result of regular classroom work that they were doing. Once they were acquainted with some of the Mac capabilities (creating graphs, word processing, making maps, data bases), they started to see how these could be used to enhance many of their traditional lessons. When the computers came in, usage centered around the activities that fit into their regular curriculum. This is in contrast to the Salem project where most computer use was planned as just that--computer use.

Site:	**Rhoades Elementary (Wayne)**
Usage Category:	**CAI Mini-Lab**
Site Visit:	**January 22-23, 1990**
Field Staff:	**Sheila Short**

INTRODUCTION

Rhoades Elementary School was awarded funding to establish an Application Mini-Lab by the Indiana Department of Education in the fall of 1988. Four teachers--two fourth and two fifth-- are involved in the fourth grade project. Of the four, two teachers have been involved since the beginning of the project. Rhoades has a new principal this year who has had minimal involvement with the project up to this point, other than providing general support. For example, he supported the project teachers' idea to bring in substitutes for their classes while they spent a day previewing the software, getting the lab ready for use, and planning. Last year, a decision was made to establish a permanent computer lab in one small room of the school and have all students go to the lab rather than move the computers around from place to place. Moving the computers from one classroom to another was felt to be too inconvenient, especially since the network server has to be moved along with the computers. It was also felt that moving the computers around to classrooms would require that the classrooms be larger than what they are.

This CAI Mini-Lab continues to be implemented as a stationary computer lab with ten IBM computers. Last year getting the server hooked up properly was both time-consuming and troublesome, and this year it seems to be rarely used by the project teachers. The server provides the teachers with a lot of traditional computer-assisted instruction (drill and practice) software that the project teachers don't want to use. Another interesting change from last year's implementation involved using the computers for writing. Teachers frequently used "Logowriter" last year for both writing stories and drawing pictures according to last year's report and one fifth grade student who was in the program as a fourth grader. Although writing is not required for this usage category, there's little evidence that much writing has been accomplished up to this point this current year.

FINDINGS

<u>Observations</u>:

During the winter site visit, the evaluator collected data through teacher and student interviews and observation of one class of project students in the lab. During the observation, 22 students visited the lab and worked in small groups of two and

three students to a computer. Two computers were not working on the day of the site visit. When students came in and couldn't get the computers to work, they called the teacher for help. When the teacher couldn't get the computers working, she assigned the students to work with other groups. The computer activity that day involved working on the program "Where in the USA is Carmen Sandiego?", something that the students had obviously been working on for some time. "Carmen" is a piece of problem-solving software in which students must fit clues together and answer questions in order to locate Carmen. To win the game or to find Carmen, students must understand relationships among clues and geography. The group dynamics for a small group of three students was interesting to watch. As the program was booted up, each student took his or her place. One student operated the keyboard, one student read the clue from the screen, and one student looked up the clue in a booklet created by a teacher last year to provide assistance to students playing the game. When students worked in pairs, one student both read the screen and operated the keyboard while the other looked up the clues. Students certainly enjoyed playing "Carmen" and devoted a good deal of attention to the game, even though the lab room was small (not a room at all actually), and the noise level was high at times. During the activity, the teacher "floated" from one group to another, monitoring what the students were doing. Several groups had a little difficulty in the beginning or had questions for the teacher, but most worked independent of the teacher. At the end of the lab period, the students were reminded to save their program so that they could continue the game at some later time.

Teachers:

Three of the four teachers were briefly interviewed as a group during the winter visit. One teacher was interviewed individually to collect detailed information. Teachers generally felt that the project was moving along much as it had been the year before. One of the teachers who was not in the project last year indicated that she felt somewhat unprepared to begin the project this year. The area causing her particular difficulty was knowing how to integrate the computer into the already existing curriculum, since she had no formal training or experience from which to draw upon. She indicated that it would have been extremely beneficial to at least talk to someone who had done it successfully. She pointed out, as did another teacher, that the project took a lot of time to implement it correctly and that there was little time during the regular school day for students to spend much time on computers. The other teacher reported that he had an extra special class (health) to teach this year and did not have time to go to the lab on a regular basis. A schedule was posted in the lab that indicated each teacher had a time ranging from 30-45 minutes to use the lab if they chose to do so.

The project teachers did, however, spend time together at the beginning of the year for a day to preview software and familiarize themselves with the equipment. All teachers felt that this time was well spent.

When asked what were the two biggest benefits received from being involved in the project, one of the project teachers responded: 1) increased awareness and knowledge of computers and technology, and 2) seeing students become more independent of the teacher by not always looking for the teacher to solve the problems and supply the answers. Teachers thought the objectives pertaining to promoting cooperative learning and enhancing problem-solving skills were the two areas that students would most easily achieve some measure of success this year. They felt the problem-solving software that they used such as "Carmen Sandiego" and "Factory" and "Hot Dog Stand" would help students work together to solve problems. The objective having to do with individually paced learning was the objective felt to be most difficult to achieve. One teacher again mentioned the time factor involved in working on a regular basis in the lab as an element making it difficult to give equal time and effort to all project objectives.

When asked about organizational patterns most often used and what was thought to be most effective, teachers felt that two or three students per computer was great for the problem solving and cooperative learning. One teacher mentioned that she did a lot of whole-class demonstration to get the students started. The other teachers felt that the students were now beginning to take a more active role in their learning when working on the computer and were independent and responsible about what needed to happen in the lab.

The four teachers at Rhoades displayed somewhat inconsistent levels of commitment and effort to the project. It appeared that two of the four teachers made a good effort to get into the lab as often as they could; of the other two, one made numerous comments about how lack of time prohibited him from getting his students into the lab on a regular basis. At any rate, once the teachers got their students to the lab it appeared they haven't gotten much beyond the problem-solving programs in general and "Where in the USA is Carmen Sandiego?" in particular. One teacher explained with great pride that another teacher had gone through the entire "Carmen" program and had matched clues given in the program to geographical areas of the country. These clues had been typed, organized, and produced in a booklet form. Each computer station had its own copy, and one student in the pair or team was typically assigned to look up the clue in the booklet and read the corresponding geographical area to the student working the computer. The teachers did not seem to realize that by permitting the students to use the booklet to look up the answer to the clues that they were denying them the opportunity to learn and develop the strategies to solve the problems without assistance.

Students:

Students reported that they are using the computer a lot more compared to last year, that they like using the computer to play games like "Where in the USA is Carmen Sandiego?", "Hot Dog Stand," and "Safari," and had not used the computers so far this year to write stories. The project students observed in the lab during this site visit appeared comfortable and at ease with the computers as they played "Carmen".

When asked what makes using the computer for learning fun, students responded, "It's easier than doing stuff with a book. You don't think you're learning because you're having fun but you are"; "I think it's more fun than using your hand"; and "It's never boring." For the most part, students had difficulty thinking of anything hard about using the computer, other than just learning the various keys and commands. Students reported that they generally worked with other students on the computer and preferred it because "you can go faster" and "they can help you." One student wanted to work by himself at least some of the time because he could do what he wanted when he wanted.

SUMMARY

The fourth grade CAI Mini-Lab at Rhoades Elementary School in Wayne Township has not been implemented this year as intended. The mini-lab concept which required that seven or eight computers be moved as a unit from classroom to classroom was changed to a permanent computer lab of ten IBM computers. This change was made during the first year of the project and has continued this year. Each classroom has access to the stationary lab that is located in the fifth grade wing of the school and has a time on the daily schedule to use the lab if they choose. Two project teachers who are getting their students into the lab on a fairly regular basis have involved their students almost exclusively with software designed to enhance students' problem-solving skills, such as "Where in the USA is Carmen Sandiego?". The two other project teachers who because of time constraints have not been able to use the lab as much, certainly have not expanded much beyond this one area.

The project has generally suffered from a number of problems this second year, some of which have simply been a continuation of last year's difficulties. However, the project has been successful in providing the students with hands-on access to the computer, developing and strengthening cooperative learning skills, and promoting problem-solving strategies at least to a rudimentary degree.

The overall objectives of the project call for:

- using the computer as a tool for enrichment, creativity and productivity in math, social studies and science;
- improving teacher effectiveness through the use of utility software;
- promoting cooperative learning;
- using individually-paced learning activities;
- enhancing problem-solving and higher-order thinking skills.

The project teachers, like most teachers, are involved in a myriad of activities that sometimes prohibit a consistent level of involvement and have opted to emphasize the problem solving and cooperative learning objectives somewhat to the detriment of the others. However, these objectives are destined to remain unmet unless the project starts to gain momentum soon. In the opinion of the evaluator, teachers are not in complete understanding of the project objectives, key elements, and the mechanics of project implementation. Lacking an individual within the project to spearhead this initiative, and/or an internal or external monitor of project activities, this project has not been able to realize its fullest potential. When a computer is broken, there is no one individual responsible for troubleshooting, nor is there a system in place to get things going again. Students have not yet perceived the computer as a valuable tool for instruction; they are still playing "games" on it and view it as a toy. Setting the direction for the project at the beginning of the year would have provided a framework from which to build that would have entailed reviewing last year's efforts, assessing what worked and what didn't, reviewing and reinforcing project objectives, and identifying particular areas of emphasis for this year. Unfortunately, this did not take place. Networking and sharing information and experiences with other CAI Mini-Lab sites this fall would have helped to build this framework as well.

It was interesting to note that even during the winter visit some teachers reported that students were eager to try other things and to learn more about they could do with a computer. Those teachers, unfortunately, did not interpret that to mean the project activities should be broadened. The project is certainly far enough along in the school year to have expanded beyond its present level of effort. With no strong impetus for going beyond the current scope and with an increased level of daily school activities that occurs as the year progresses, the Wayne Township site will likely not attain some of the project objectives described earlier.

Site:	**Rhoades Elementary (Wayne)**
Usage Category:	**CAI Mini-Lab**
Site Visit:	**May 24-25, 1990**
Field Staff:	**Sheila Short**

INTRODUCTION

The CAI Mini-Lab in operation at Rhoades Elementary School in the M.S.D. of Wayne Township has nearly completed its second year of implementation. The mini-lab has been implemented as a stationary computer lab that is located in the fifth grade wing of the school. Two fourth grade and two fifth grade classrooms are a part of the project this year.

Last year, the project suffered considerable start-up problems and really did not become functional until the winter. One of the first decisions that was made was to abandon the mini-lab concept and establish a permanent computer lab in one room of the school and have all students go to the lab. Moving the computers around from one classroom to another was felt to be too inconvenient, especially since the network server would have to be moved with them. It was also determined that moving the computers around to the four classrooms would require that the classrooms be unusually large. This year, the mini-lab concept has not been established; teachers continue to use the permanent lab as they did the year before.

FINDINGS

Observation:

One classroom of fourth grade students was observed in the classroom this spring. Students entered the lab confident and eager to begin the computer lesson. They knew who they were working with and what they were going to do. The teacher had the students in small groups of twos and threes working on the program "Where in the USA is Carmen Sandiego?" (the same program that they were working on during the winter visit). The evaluator questioned a few students regarding why no one had located "Carmen" before this point in the school year, and one student indicated that the programs had gotten erased, and some students had to begin again.

Students worked cooperatively together and seemed to understand that by working together they could accomplish much more than they could alone. In a group of three students, one operated the keyboard, one read the directions and clues from the screen, and one looked up clues and corresponding geographical areas and read them aloud. As a group they decided what to do.

Teachers:

During the spring site visit, data were collected from two of the project teachers, one fourth and one fifth. The fourth grade teacher was not involved in the project the first year of implementation. The teachers indicated that the two biggest benefits they received from being involved in the computer project were: a better awareness of computers and cooperative learning by the children. Another teacher indicated that whole class instruction and improved cooperative learning skills and techniques.

When asked to indicate the two biggest benefits for the students, teachers reported that students were provided with the opportunity to have hands-on experience with new technology. It was also mentioned that students were motivated to complete their classwork in order to work on the computer. Teachers were also asked to indicate what changes have occurred in their teaching as a result of their involvement in the computer project, and they reported that they were now more flexible in their teaching than they had been previously. Teachers are also using more whole class instruction and then making assignments on the computer, since they can go into the mini-lab rather than rely on scheduling use of the two computers in the classroom.

When asked to indicate the instructional uses of the computer this year, teachers reported that they use the computer mostly for problem solving, math, study skills, and creative writing. In math, "Hot Dog Stand" was primarily used. "Codes," "Safari," "Search," and "Carmen Sandiego" were used to teach problem-solving skills. "LogoWriter" was used for editing purposes.

Specific examples of attitudinal changes in students that teachers have observed as a result of increased computer use include more peer support and more peer tutoring. Instead of relying on the teachers to assist them when they run into difficulty, they frequently ask each other or work together to solve a problem. In fact, teachers report that they see the largest growth for students in the area of problem solving. One teacher stated, "They think, discuss, conclude... it's great."

In the opinion of this evaluator, the students have barely scratched the surface in the area of problem solving. There still remains much to be done. Students need to see the broader application.

There's a somewhat large discrepancy in what teachers report in terms of average amount of time that students spend in mini-lab when compared to student responses to that same question. One teacher reported that her students spend on the average about 30 minutes a day in the mini-lab. Another teacher reported that her

students spend anywhere from three to five hours a week in the lab. The schedule for the teachers participating in the project indicated that classes are scheduled to use the computer anywhere from thirty to forty five minutes. The schedule did not list the days teachers were scheduled to be in the lab.

One teacher reported that her students used the computer to write stories but found that most students felt it easier to type a story they had already written and use the computer to make edits than compose the story at the computer. Both teachers indicated that the modem had not been used on a regular basis this year.

One teacher reported that she made extensive use of simulations, thinking skills software, student word processing , and graphics production this year while spending little to no time at all on computer-assisted drill and practice, teacher demonstration, programming, and database/spreadsheets. The other teacher interviewed during the spring site visit had very similar areas of emphasis.

Students:

While fourth grade students interviewed during the site visits reported that they used the computer a lot more this year compared to the previous year, fifth graders (two of three were in program last year) gave a wider range of responses when asked that same question. Both fourth and fifth graders indicated that their favorite computer activities were "Where in the USA is Carmen Sandiego?", "Hot Dog Stand," "Animal Safari," and "LogoWriter".

It was interesting to note the different types of activities that students said that they wanted to learn how to do on the computer. One student said she would like to do math on the computer. Another indicated that he would like to learn to use the mouse. Several reported that they would like to learn how to draw, make signs and shapes, or draft using the computer. When asked what makes using the computer for learning fun, students mentioned, "It's just like a teacher teaching you, but it's a machine"; another stated, "You learn a lot that you can't using books and paper"; and "You get to learn how to use the keyboard and it helps you learn in different subjects." Students found it hard to think of anything that was really difficult about using the computer other than learning the keyboard and the commands.

Students generally worked with others when using the computer, and five of the six interviewed preferred it that way because they could help one another.

When students were asked to describe the one thing they have learned to do on the computer that they are the most proud of, two students mentioned their adventures trying to find "Carmen". The

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evaluator asked students whether anyone in the class had found "Carmen" as they had been playing the game since the beginning of the year. One student reported, "We almost did but somebody erased our names so we had to start over again." Another student indicated that no one had found Carmen yet, although several groups were "getting close."

Students were asked to describe what they would do if they were in charge of setting up a new computer program in the school. Most responses were more practical than creative or innovative. Generally, students indicated that they would purchase equipment and software, talk to the people who would be involved in the program, and begin with what they perceived as an easy subject area.

SUMMARY

The CAI Mini-Lab at Rhoades Elementary School in Wayne Township continues to operate below its fullest potential on several program components.

APPLICATION MINI-LAB

Site:	Washington Elementary (Westfield)
Usage Category:	Application Mini-Lab
Site Visits:	February 23; May 24-25, 1990
Field Staff:	Beverly Farr

INTRODUCTION

This site includes two teachers who were involved with the project last year and two who were not. The lack of focus and direction that was evident was apparently a direct result of that fact. The two teachers who had been with the project last year and had left the school were the ones who knew more about the computers and had used them with students to a much greater extent. This left two teachers who felt less competent about dealing with the computers and two who were waiting for the ones who had been with the project to tell them what to do. It was apparent that there was a lack of leadership and experience that really handicapped the project for the entire first semester. The teachers were exploring in a somewhat random manner the possibilities for instructional use. They were generally unfamiliar with the usage category description and were, therefore, unable to describe what was difficult and what was easy about their particular requirements. The new teachers had had some prior experience with computers, so they were able to "feel their way" into some use of the Macs.

At the beginning of the second semester, the computers were being used in limited ways to support social studies and science, and the teachers were also helping the students to feel comfortable using Mac tools to produce graphics. There was little use of the computers for math. The teachers were using the computers for their own purposes to a limited extent, although one teacher who did not do so last year was very excited to have her grades on the computer.

By the end of the year, the teachers had gained much greater control of the computers and were using them in more meaningful ways. They were clearly also feeling more excited about the potential of computer use for instruction. Several classroom projects that had been accomplished using a database with graphics support were indications both to the evaluator and to the teachers that much more could be accomplished. They were looking forward to implementing some of these ideas next year.

As they had been at the end of last year, the computers are located in one empty room along the fourth grade corridor. Each teacher is assigned one day of computer use per week. Typically one half of the class goes to the computer room, while the other half continues to work in the classroom with the teacher. One teacher has a room adjacent to the computer room with a movable

wall. Often, she and another teacher put their classes together and monitor computer use as they work in the double room. The teachers all felt that it was easier to keep the computers in one place.

FINDINGS

Observations:

During the first observation, the students were working together in pairs or threes on reports they were typing from handwritten drafts. They shared information and offered advice; they seemed less than facile in their ability to move around and handle the computer and software. They were largely unsupervised. When one student had difficulty booting the computer, she went to the classroom and told the teacher and then had to wait for the teacher to come to provide assistance. During the observation at the end of the year, the students seemed much more competent with the MACs. This time, the room divider was open, and the two teachers worked together with two classes of students. The students were using graphics to depict geological formations as part of a project they were doing. Their productions were fairly good, and they seemed to be quite familiar with the software. Again, they worked in pairs, with one student using the book or pictures to advise the student at the computer about the desired appearance. The representations were labelled showing different aspects of the formations.

Teachers:

In this case, there was one teacher who was interested and willing to experiment further with the computer after being "spoon-fed" last year by one teacher who really managed the project and the computers, but she felt very unsure of herself. One teacher was still quite skeptical after two years about the effectiveness of computer use and was still very much a teacher-in-front-of-the-class. She had conducted a noteworthy project with the students, creating a database on the planets, but she questioned the wisdom of taking so much time to do it. The two teachers who were new to the project were very enthusiastic and were trying several different things, but they were scrambling all year trying to figure out what they should and could be doing.

At the first visit, the teachers were doing little more than using "Carmen Sandiego" for problem solving, "Earthworks" and other programs for mapping and studying geography, and tools such as MacPaint to help students become familiar with the versatility of the MAC. They were also edging their way into the use of database and spreadsheet to summarize survey results, Hypercard for some reports, and limited word processing for stories and reports. (The use of computers for language arts was not part of this usage category.)

By the end of the year, things had changed at this site quite a bit. The use of computers was much more focused; several substantive projects had been completed. At the same time, it was evident that there was no vision or cohesive plan for using computers as an integral part of the curriculum They had, however, made plans for organizing their efforts more efficiently for next year. It was agreed that one teacher would be in charge, and they were discussing changing the scheduling format. As it has been conducted the last two years, with one teacher having the computer each day, it did not maximize the use of computers.

Goals. During the first visit, teachers' responses to the question about personal goals reflected their lack of comfort and familiarity with the MAC. They wanted to be able to "open/close any program," "use the mouse effectively," "become familiar with the applications," "understand the tools," "do Hypercard if it kills me." By the end of the year, the teachers expressed considerable satisfaction at their progress and at the results for their students. They felt more "relaxed," improved their attitudes about integrating it with the curriculum, and gained a great deal more knowledge about the MAC and its tools. They seemed much more confident about moving forward.

Instruction. While the programs used by the teachers did not change from February to May, the use of those programs was notably more sophisticated. They were clearly exploring the programs with the students in February, trying out the use of database and spreadsheet, for example, for reports on states for social studies and planets for science. They were helping students how to learn to move graphics in Hypercard. They were also using the computer to work on some language mechanics (not part of usage category) and "Print Shop" to generate timelines. By May, the students were creating interesting graphics to accompany their completed database information on the planets and were developing representations of geological formations to support their study of geology in social studies. They had also completed a database for states in various regions of the United States. This work was supported using Hypercard with which they had learned to use "buttons" to link cards and stacks containing information about states. While all of these projects were quite interesting and reflected considerable growth since the first visit, they do not represent what could have been accomplished after two years of consistent application.

It should be noted that when the results of the interview probe regarding educational and instructional support uses were compared from the first visit to the second, it was evident that the teachers had increased their use of the computers for demonstration, for keyboarding, for programming, for utility purposes, and for teacher word processing. They had increased it much more for database and spreadsheet and a little more for graphics and on-line database searching. This change is also

evidenced by the fact that the results for the second round are more in line with the general results for this usage category. After the first visit, they came up short in database, graphics, and on-line searching when compared to the other sites in this usage category.

The teachers were all enthusiastic about the use of cooperative learning and the positive effects it had had on students. This had also increased considerably from the middle to the end of the year, mostly because of the improvement in the quality of the projects being conducted using the computer. That is to say, students had meaningful activities they were enjoying that were enhanced by their cooperative efforts.

When asked about non-computer changes in their teaching at the middle of the year, the teachers all indicated that it was in their instructional planning, that they had to find ways to integrate the computer with the curriculum and to integrate the content areas as well. At that time, they also expressed reservations about their ability to do so. "I think more about how to integrate the computer with my teaching," but I "had trouble thinking of problems" (in science, for example), commented one teacher. This, too, seemed to have improved by the end of the year. More comments were heard such as "I have learned that more things can be accomplished on a computer that fit in with the curriculum." One teacher summed up the change in instructional climate well by stating, "The children often become the teachers with their peers, and my role often is one of advisor and mediator. All of the teachers commented that they used cooperative learning to a much greater extent and that they saw tremendous benefits. They also acknowledged that the training provided on cooperative learning was a great support to them.

Teachers reported anywhere from one-half to three-and-a-quarter hours of time at the computer per individual student. By the second visit, this range had increased to one-five hours per week. This variance is, in fact, accurate, since some teachers used the computers considerably more than others.

<u>Effects on Teachers</u>. All of the teachers expressed their appreciation for the benefits the computer project has meant for them. These benefits were described in terms of personal growth and in terms of their progress as a teacher. They liked having learned the MAC and what it could do--indeed would not exchange the MAC for any other computer--and saw great value in using it to support their teaching classroom management. Most of them felt they would not able to function effectively without one anymore. They also liked the fact that the computers had forced them to stretch and to improve their teaching by integrating the curriculum and by using different grouping strategies for students to learn cooperatively.

Students:

It is interesting that teacher responses to the probe about benefits of the computers for students had also changed in tone and quality by the end of the year. At the first visit, they mentioned computer literacy and familiarity, cooperation, creativity, and independence. By the second visit, their comments were qualitatively different: "Students enjoyed learning and will retain more of the information"; "The joy of doing something unexpected and having it be right, the freedom to experiment"; "Sharing ideas, working together, feeling pride in a finished product"; "I feel any time spent on a computer better prepares them for a future job. They also learned about many different options--spreadsheets, databases, and card stacks." The teachers had reported goals for the students of being more comfortable with the computer and familiar with the programs and their applications. They wanted them to "expand their vision of what the computer can do." They also wanted them to develop their skills at working cooperatively; all of the teachers felt that these goals had been accomplished by the end of the year.

Attitudes/Achievement. At the first visit, teachers reported generally positive attitudes about the computers--enthusiasm and excitement. They indicated that they were "not afraid of computers...don't mind making mistakes...more self-confident." Several of the teachers specified that students who were timid or hesitant had overcome those inhibitors as they worked on the computers. One teacher reported that there were groans when the students had to "correct stories. They don't like to perfect their work." In terms of achievement, the teachers really had to think about outcomes; one felt the only difference she could see was in their "working together, cooperative learning."

By the second visit (with the increase in more meaningful projects), teachers were more specific about student attitudes and achievement: "Some students are anxious to do research projects;" "The seem less fearful, also more excited about trying something new;" "More students are reluctant to leave the lab; this reluctance increased as the students learned more about what they could accomplish." They also commented that "doing planet research was more fun for them." "Students were able to verbalize more of the information; retention of information seems to be longer than just up to the test date; test scores improved." With regard to work habits, one teacher pointed out that "they realize the cooperation that it takes to work together; creativity has been enhanced. There is a willingness to take risks."

Instructional Activities. Student responses during the first visit indicated that they were doing somewhat less than other sites in this usage category in the areas of word/number games, science, social studies, using databases/spreadsheets, and demonstration/experiments. By the second visit, they were clearly

doing more science and social studies, more database, and more demonstration. They more nearly matched what was going on in other sites.

Effects on students. Student comments also reflected a change from the first to second site visit. At the first visit, students reported liking to write stories best, although one indicated that he liked working on the Hypercard project on the states. By the second visit, students were consistent in reporting that they liked working on their research projects, the planets, the ocean floor, solar system; they also reported that they liked experimenting, learning the computer's capability. In the beginning (and February was truly the "beginning" for this site this year), when asked about what made the computer "fun," they said things like "your hand gets tired writing (with a pencil)," or they said they didn't know. By the end of the year, they made comments such as "you get to do things you didn't know about" and "learning about technology." The latter comment indicating an interest in technology was also reflected in their responses regarding what makes the computer difficult to use. While they commented more about the difficulty of keyboarding in the beginning, at the end they were much more intrigued with the capabilities of the programs and the inner workings of the computer. In summary, there were indications that these students had gained some measure of confidence, interest, and sophistication in their computer use. These were almost evenly divided in their feelings about whether it is better to work alone or with others. One commented about working with other students, "You can make sure what you put down is agreed upon or right;" but others liked working independently because "you don't have people yelling at you;" "Everybody tells you different things to write, and you get confused."

SUMMARY

This project clearly got a very slow and shaky start this year due to lack of leadership and uncertainty about what should happen. There was no evidence of any vision or conceptualization about how to use the computers in an integrated way with the curriculum. The computers had been moved to a separate room last year, so there was no "computer presence" in teachers' classrooms that would demand more attention to their meaningful use and integration. There was a lack of computer literacy and familiarity that made it difficult for them to forge ahead. With two new teachers and two who had been the least familiar out of four last year, the project struggled for several months. Students were using the computers and were enthusiastic about doing so, but they were clearly unaware of the computer's real capabilities and the potential for expanded learning.

Much of this dismal picture changed from the first to the second visit; there was significant improvement. One of the new

teachers assumed more of a leadership role and stimulated the other new teacher, as well as the two who had been with the project last year, to explore more avenues for curricular integration. While the activities and projects were more peripheral to the curriculum than would be desirable, they involved the learning of important information, and students apparently gained a lot of knowledge from the experience of completing each one. Teachers were more consistent in their approach and more mindful of the outcomes as evidenced in the logs they kept (as requested by this evaluation) and the compilation of student work they bound in a notebook and shared with the evaluator.

The teachers have been discussing and planning quite a bit for next year, and I feel that their ideas and intentions will establish the project on a much firmer footing from the outset. They are reconsidering the schedule for computer use and have agreed that the teacher who assumed the role this year will be officially identified as the manager next year. As indicated on their interview probes regarding recommendations, all are interested in changing the schedule to time blocks rather than being assigned separate days. They are divided on whether a separate lab or in the classroom is the best location. Some just do not like the problem of moving them. There is interest in integrating more language arts and incorporating keyboarding. Most felt it was fairly easy to integrate science and social studies instruction; they wanted to find more to do in Indiana history and math. All liked the application tools available, although some felt they needed more training in the use of Hypercard. They projected more use of the computers for research work.

In summary, this year has been a struggle and the project floundered, but rather than giving it up as a total and irremediable loss, these teachers have set plans in motion for improving the situation next year, and they have learned quite a bit about how to use the computers more effectively.

Site:	Perry Central (Leopold)
Usage Category:	Application Mini-Lab
Site Visit:	January 18, 1990
Field Staff:	Lou Emge

INTRODUCTION

The effective use of the nine Macintosh computers, which are revolved on a daily basis among four classrooms, was observed during this visit. Teachers continue to strive for meaningful ways of using the Mac's power to involve students in their own education. This is being done in math, science, and social studies, as well as quality writing activities related to science and social studies. Hypercard is being used to build "Animal Adaptations" stacks in science. Graphs, charts, spreadsheets, and data bases are being created. Less writing is taking place this year at the Mac. Writing is not an objective of the usage category. Word processing was done last year as they tried to learn ways of using the Mac. Students still write, but it is more functional, such as scripting a stack for science.

The teachers generally exude a real confidence in what they are doing as meaningful to their students. They feel genuine pride in their accomplishments and how far they have come in a little more than a year. One teacher talked about now being considered a respected resource on computers, when at the beginning of last year she knew absolutely nothing. One teacher said she now knows how kids feel as they are learning, and that she feels confident to learn along with them, rather than having all the answers. A benefit for her students, one teacher expressed, is "a more energetic teacher," which says a lot about the power of renewal in the implementation of meaningful educational change.

The project has shown continual growth and development from the initial visit in the fall of 1988. Teachers are still excited about things and are beginning to institutionalize some of the uses of the Mac that they have found most successful. However, they seem to understand that there is much more out there to learn. The continuation of the weekly Monday meeting after school has much to do with the outstanding growth of the project. This extra sacrifice of time and effort provides the opportunity for peer support, sharing of successes and failures, time for inservice, that are so necessary to sustaining the effort required to make the kind of changes these classrooms have shown.

FINDINGS

Observation:

The fifth grade classroom that was observed was involved in building stacks in science. Surprisingly, students were actually using keyboarding to enter information in the stacks. The keyboarding skills are a result of their attendance in a school lab that all students attend. There was much more touch typing going on here than any other site visited by this evaluator. This was not due to the project but does show that students can learn this, if given good instruction over a sufficient period of time. (They get both of these in the school's class.)

The computer use observed was well-aligned with the text, as it served as the basis and one of the resources for the activity. Different groups will end up with different information on the subject, depending on the direction they choose to take. The teacher talked about children working to their capabilities, not being limited or lost by the usual lockstep instruction. With nine groups each working on their own stack, it was slightly chaotic in a good sort of way. Students were trying all kinds of Mac capabilities in making stacks. The teacher served as a facilitator of learning, not necessarily having all the answers. If it was a tough question, she often solicited help from the entire class, and usually someone knew how to do it and would supply the needed assistance.

One group was trying to show an air mass above a body of water they had made. They came to the realization that you really can't see an air mass and were trying to find a good way of representing something on the screen that you really are not supposed to be able to see. They were synthesizing the science activity with their own creativity with the power of the Mac.

Teachers:

The teachers took great and well-deserved pride in their accomplishments. This site visit really gave them the opportunity to look back from the first visit during the fall of 1988. Both the teachers and the evaluator were amazed at how much had happened. They had grown as professionals, grown as teachers, felt better about what they were doing, and felt they had much to offer others as they try to implement meaningful computer activities.

Some of the changes in their regular teaching that were reported included: more student centered, less structure; allowing students to make decisions; less textbook and more use of library as a resource; and, much more cooperative groups for learning.

Since this was a "late" fall visit, the evaluator was particularly interested in what goals they had for themselves and

students for this year. Three of the teachers specifically stated "Hypercard" as an area they hoped to emphasize during the year. Additionally, one teacher mentioned better cooperative learning methods, learning about desktop publishing and hypervideo, as well as refining the use of things learned the previous year. Another teacher was interested in the video disc capabilities to go with "Hypercard". Another wanted to do more with spreadsheets, databases, and word processing.

Goals for students included more independent learning and specific activities primarily related to teacher goals. One teacher said that she really had unrealistic goals for her students at the beginning of this second year. Since the Mac was new to her students, she felt she needed to get them up to speed on using the Mac in a hurry, so she could get them involved in all the wonderful things she had learned. She soon realized she was really showing them far too much and not letting them do some experimenting and learning on their own, things that had proven so beneficial to her and her students during the first year. Teaching has traditionally been imparting knowledge. This example points to a teacher who knows there are better ways and even is able to "self-correct" to get back on the right track, rather than falling back into the old ways.

One teacher uses the screen projector all the time for instruction and demonstration. This is a strong and seldom-used computer use for any of the usage categories that has great potential for any classroom with access to a computer and projector.

Teachers talked a lot about the improvement of their students in working together cooperatively. One teacher stated, "There are no nerds when it comes to computers." They report better interpersonal relationships among students and students; they are more willing to work with others they don't particularly like. They talked of students being more excited about school, and a girl who seldom completes regular assignments but is able to complete computer tasks. One teacher feels her students have gained an expanded view of learning (beyond the textbook).

Word processing and writing, areas not in the usage category, receive more than incidental attention in some of the classrooms. One reason is that students learn to type in the school's computer lab, so come with typing ability. Another is the appeal of the computer as a tool to really help children write more and better. It is difficult to let opportunities go by, when the computers are there and the children need to write. Two of the teachers reported that students are only doing functional writing using the Macs, writing used in other activities such as building stacks. The other two teachers seem to be involved to some extent in process writing related to English or reading lessons for example. With the limited time the computers are in the classroom, roughly one

day per week, it would seem that process writing can become an easy distractor to more meaningful uses of the Mac, activities that cannot be done without the computers.

Students:

What stood out in the interviews with students was the variation in responses. During the half-day visit it is only possible to see one classroom using the computer. One must be careful about generalizing too much from the single-class observation, as it is evident from the student interviews that implementation may be quite uneven in the different classrooms. An example is a response to using computers to learn social studies. One student reported "very often," another "some," and the third "none at all." Science/health was answered with similar variation, but "some" and "not at all" responses were reversed for the latter two students.

SUMMARY

There is much to be learned about implementing effective instructional uses of the computer from this project. This evaluator would highly recommend continued support for this site as a valuable source of information and in the development of models. One of the major reasons for this project's success has been because of its use of the Mac. Not only because of Mac's capabilities, but more so because of Mac's limitations. As indicated in a report last spring, the Mac forces the teacher to look within the capabilities of the computer for good uses, rather than for "magic software" that, once found, will solve all the problems of using the computer for instruction.

Many other factors have gone into the site's success to date. The weekly meetings, teachers willing to give the extra effort, an initial informal leader and the emergence of others to share that leadership, a district where computer use is valued, a principal who is supportive--these are some of the things that come to mind as factors contributing to success.

Site:	Perry Central (Leopold)
Usage Category:	Application Mini-Lab
Site Visit:	May 9, 1990
Field Staff:	Lou Emge

INTRODUCTION

The objectives for this usage category use terms such as--enrichment, creativity, productivity, teacher effectiveness, cooperative learning, problem solving, and higher order thinking. In the opinion of this evaluator, these terms truly come alive in this project.

There are four teachers, two fourth and two fifth grade, involved in the project. The fourth grade teachers are implementing the project in a manner and at a level that is very comparable to the other sites visited by this evaluator. The fifth grade teachers are implementing the project at a level that far exceeds the highest expectations of the evaluator. This evaluator has chosen to highlight the best things that are happening, rather than striving for a balanced picture of activities among the four classrooms and teachers. This is not to diminish the work done by all teachers but seems to be the best use of the findings. The benefit to the reader of the report will be to get a picture of what can be accomplished as exemplified by the accomplishments of the most successful teachers and classrooms. Two such teachers, working together and sharing, have accomplished much and reported it in detail. One teacher turned in ten project logs of noteworthy activities.

A small deviation from the usage category description is that eight, rather than six, computers were used by students. The usage category description for 89-90 reiterated the mini-lab design of 4:1 student to computer ratio. Having eight computers for student use has not seemed to have had much of an effect on the major content of this report. The kinds of group projects and uses that will be described could probably have been done about as well with six computers. Where it would probably have the greatest effect is in the substantial word processing activities used by fourth grade teachers and not a focus of this report.

The evaluator sees this site as being very successful. The kind of student projects that were seen, the materials examined and heard described are on the "cutting edge" of what education can become. What is even more astounding to this evaluator is that these were fifth graders doing this in a very rural setting under the direction of largely self-taught teachers. The site did, however, have some advantages which created an environment for success:

The project, from the beginning, had the full support of the principal. The district is very "pro-computers".

Teachers were allowed to adjust times, curriculum emphasis, etc. to meet their needs in implementing the project.

There is the expectation that all teachers stay and work after school, so the every-Monday, two-hour joint planning meetings with the four teachers that took place the last two years were something that these teachers viewed as part of their job.

From the beginning, they decided to rotate the computers on a daily basis, rather than every two weeks or some other arrangements. This seemed questionable at the time, but it turned out to be one of the important factors in success. Having the computer a certain day every week gave a focus to computer use and allowed teachers and students to plan activities throughout the week that could use the power of the computers on the day they were available. Computer use was not so much an event as an integral part of everyday instruction.

The flexible scheduling (Example: A fourth grade project teacher who is on a different floor takes his students to the other fourth grade room to use computers. Not an ideal set-up but it shows flexibility.) is an example of the flexibility permitted in working out things in the best interest of the computer project.

The Macintosh, from the beginning, was recognized as a computer unlike the Apple and IBM in many ways, but most significantly in not having friendly CAI software. Other uses needed to be explored. The two fifth grade teachers were able to learn and use these other uses. The other two teachers primarily stuck with more traditional uses of the Mac, and probably would have been served as well or better by Apples and appropriate software.

It is not the intention of the evaluator to create a dichotomy between the fourth and fifth grade teachers. They are all capable professionals. As an example, all four co-presented "MacMagic: It's Elementary!" (copy of handout attached) at the state conference in Indianapolis. Also, when interviewed as a group during the last site visit, all four had their own ideas about best uses and could substantiate why they felt that way. It is simply that the fifth grade teachers went in a direction that seems most important to share with others.

The project continued to grow between the two visits. This is exemplified by the accomplishment of teacher goals for the year shared at the January visit and checked on at the May visit.

FINDINGS

Observation:

Some of what was observed during the visit to one teacher's classroom, learned from demonstrations, and learned from asking questions of teacher and students are the following:

Students were involved in a project involving regions of the United States. The project used the text as a starting point. Children read the text and through group discussion came up with questions they had and information they thought was particularly interesting. (Assignment sheet attached.) Students worked in groups of four, so all eight of the computers were not being directly used by work groups. There is division of labor among members of the group with only one or two working at the computer. The other group members are working at their desk or going to the library to look for information. Roles alternate per a group-agreed-upon schedule. Students leave the classroom to go to the library during this time without telling the teacher. The teacher reported there has been no observed or reported problem with this. Students have a reason to go, are motivated, and stay on task. Later during the visit the librarian was questioned, and she reported that it worked well when these students came to the library.

Some students wanted to include pictures in the stack they were building. Several of the "student experts" quickly hooked up "Scan Man" and helped other students scan pictures into the stack they were building. An interesting sidelight about "Scan Man" is that they had the software for some time, but the teacher could not find time to figure it out. Finally, "Three of my boys decided to take control" and asked if they could figure it out on their own. The students read the manual, set up the scanner, and used trial and error. Using a combination of class time and recess/lunch hours, the group had it figured out in three or four days. They became the experts, taught it to the teacher and classmates, and to the other fifth grade room.

This particular outcome of students teaching themselves "Scan Man" and sharing their expertise with others is important for several reasons:

1. Students are highly motivated.
2. Students feel confident as problem-solvers.
3. The teacher is sure enough of herself and students to let them try it own their own.
4. The teacher and students learn from other students.

During the observation, students were very eager to show their Mac skills. They showed projects they had done and demonstrated

what "buttons" were and how important they were in building stacks. What was observed was a classroom in which everyone was busy on various components of a bigger task, the regional reports. Students or the teacher would call out for assistance on a particular task, usually in using the Mac to do something that someone knew it could do, but hadn't mastered how to do it. There was usually someone to help and it was not always the teacher. The extra computers (as mentioned not all were needed for the assigned groups) came in handy for experimenting and showing things. Also, as mentioned, students were freely leaving the room and returning to the room from the library. Observing this classroom was truly a unique experience in an educational career. At least for this day, there was a view of education which reached much further than traditional textbooks and classroom instruction. The teacher was truly a facilitator of student learning.

Teachers:

A group interview of about one hour was conducted with the four teachers after school, in addition to shorter individual interviews during the school day. It should be noted again that the intent here is not to give equal time to all four teachers, but to give emphasis to those activities that best exemplify the Mac and its use in this project.

There were several personal goals for the year which teachers had expressed at the January visit and which were particularly relevant to accomplishing the objectives of the Mac Mini-lab. One fifth grade teacher wanted to become better-versed in "Hypercard," more involved with video discs and creating on video discs to go with "Hypercard," and using "Scan Man". Just to be able to talk about these computer uses as the goals of a teacher who had been involved in the project for a little over a year and is more or less self (group) taught, shows the accomplishments of the teacher and the project. When asked in May about her "Hypercard" goal, she was "all smiles" as she reported she had really accomplished this. She had learned from her students who had learned from another teacher. This way of teaching and learning among teachers and fifth graders is a very significant finding from the project. She also reported some progress on the video disc goal. "Scan Man," which she and her students learned from the other teacher's self-taught students, is now an important part of her classroom. She feels it is very efficient and exciting in helping her students build their stacks and other uses.

Another teacher had as her goals to become more effective in teaching things she learned last year, to use better cooperative learning methods, and to use hypervideo. She feels she accomplished the first two very well and hypervideo to some extent. In her logs, she had a number of references to students working in cooperative groups. The social studies assignment on regions of the United States (attached) has "rules" for sharing duties. One

of the first tasks of the group was to come up with a system for using the computer that all agreed upon and signed. She has high expectations for cooperation and reported very good results. She also reported one student who had a lot of difficulty sharing the computer in any of the activities, so all was not always rosy.

The fourth grade teachers found innovative ways of using word processing in science, social studies, and math. One brought in other Mac capabilities, like charts, maps, pictures, and graphs to some degree. One fourth grade classroom was creating individualized letters for a class reunion. Also, the wife of a teacher had used the Mac at home to organize her recipes. She could find recipes using the "search" capabilities. He plans to create something similar with his classroom next year. He also reported showing the school secretary databases, and she now has new kindergarten students in a data base.

One fifth grade teacher reported building stacks as the biggest emphasis this year. Stacks serve to synthesize almost all of the Mac skills that students learn into a student-directed project and product. A prime example is the Colonization project where student groups selected topics and formulated questions, then built stacks around their specific topic. There were basic requirements (the accountability factor) that all stacks had to have as a minimum, but students were encouraged and did go far beyond this. The class ended up with perhaps six stacks which students would explain and demonstrate. At the conclusion, the question was posed as to how the individual stacks could be organized into a superstack. One of the students suggested using a timeline as the organizer. They had used timelines previously with the Mac. This turned out to be a natural as "buttons" could be placed on the timeline to access the various stacks that the student groups had created. This is an example of using higher-order thinking skills as the class synthesized and integrated many different things they had learned.

The other fifth grade teacher talked about using word processing only as it fits into other things, like building stacks. Her students had done stacks on weather and bones and muscles (which was a game-like stack). She reported students had done 20 or 25 spreadsheets for science and math and several databases for science.

Both fifth grade teachers talked about students bringing up a picture from a program and modifying it using "MacPaint" in order to fit the report. An example is putting a birthday cake on a person's head, then altering the cake to look like a hat. Another was to change the dress of a person to fit a time period. These students are certainly taking advantage of the power of the Mac.

At an earlier visit, one of the fifth grade teachers talked about wanting to get comfortable enough with classroom uses of the

computer so that she had realistic student expectations and could hold them accountable. At that time, she felt much of what they were doing was not structured enough by her to hold students accountable for a particular outcome of the activity. During the spring visit, she indicated that she has reached this level of confidence and now has accountability built into most of what the students do.

Teachers were asked about particular areas of impact on students as a result of the computer project. Following are highlights of their responses:

The students:

- see a purpose for what they are doing
- tie things together better
- are more creative
- are better decision makers
- have better research skills
- work together better and are more accepting.

The evaluator noted the following from observation:

- Students are more responsible for their own learning.
- Students are active, rather than passive, learners.
- Students feel empowered by being able to use the Mac.
- Students have real pride in their learning.
- Students have a high level of expertise in using the Mac.

Some other activities reported on one teacher's logs further show how well the project met the objectives of the Application Mini-lab usage category. Students gathered census data and entered it on databases and spreadsheets. Students wanted to go further so they posed their own questions and looked for different ways to display the information. The teacher reported that students were helping each other and that all enjoyed this because they were having success.

When introducing the concept of stacks with the Mac, the teacher showed her class stacks that had been created by her class from last year. The activity turned out to be a great learning tool as students were learning about stacks and bridging how these stacks will fit into what they were going to be doing. However, there was an unexpected outcome. Students started "critiquing" the stacks on their own, taking notes and pointing out strong and weak parts. The way students had done it last year was not accepted as necessarily the best way. Visual effects, placement of fields, and things missing became a spontaneous center of discussion.

The teacher (not the one using spreadsheet and databases all the time) decided to learn along with her students. Census information (presumably gathered through home interviews) was entered into a database and spreadsheet. The task was to sort and organize. The teacher said she had never done this activity before. When she made a mistake, "students were eager to help solve the mystery of why it didn't work. She reported that they learned together and made some great graphs after sorting the information correctly. She noted that not all students shared in the enthusiasm, as some didn't seem to care and waited for others. The activity points to risk taking by the teacher and problem-centered learning.

As a follow-up activity to the one just mentioned, groups of three students used the census information to make graphs for displaying the data in different ways. They used a variety of approaches. One of the groups quickly produced a printout and were besieged by questions from the other groups. Groups, however, were quite independent and experimented in finding their own way of producing a graph. Some groups extended this activity by making posters on the Mac.

A social studies lesson involved using a U.S. map on the Mac to construct regions and identify states using standard post office abbreviations. It turned out to be a good geography lesson, but also gave the opportunity for extending the learning experience. Groups used clip maps, MacPaint, experimented with rotating maps, etc. Some students had ideas for attaching information to states using the hypercard idea and buttons. The teacher reported, with one exception, students were working very well together and were complimentary to each other on their work.

A teacher reported pushing applications of the Mac and ignoring most packaged programs. Students and other teachers had talked about "Turbo Math" as something they really liked. Her students were in a state of revolt because they hadn't gotten a chance to use it in her room. She compromised by structuring it fairly well to where she felt it was a good experience.

Some of the logs also mentioned problems of disk crashing, not enough time, some students unable to work in groups, and other frustrations that accompany the success. However, the overall tone of the interviews with teachers and the logs were very positive toward the project.

Students:

Student interviews, as reported in the last site report, have not provided a very accurate picture of computer use in this site. Three students, representing only three teachers and in this case only one of the fifth grade teachers, were randomly selected.

One of the activities that has not yet been mentioned, but exemplifies the wide range of activities students were involved

with, was a modem hookup with NASA. All four of the fourth and fifth grade computer classrooms were in the media center, and the hookup was shown using the LCD. What was received was almost all text. However, the teachers reported that this really held the students' interest, and one of the students interviewed reported wanting to do more of the modem hookup like they did with NASA.

The kinds of activities students reported were consistent with the classrooms they came from. One of the 4th graders said she would like the computers in their room because they have to go to another classroom to use them. Another 4th grader liked writing stories and printing because they did that a lot. A fifth grader reported being particularly proud of learning hypercard stacks, especially the one on Indians.

SUMMARY

The project has many exemplary components for using the Mac as a tool for learning. Other computers, thought, have many capabilities that could take advantage of the successes experienced in this project. Where most second-year projects were experimenting with databases and spreadsheets, this project was synthesizing their use with reports, graphing, stacks, etc.

For a project to go the direction that this one did--using the power of the computer as a teaching and learning tool rather than something to run friendly software--a well-planned startup is required. The teachers gave excellent suggestions for startup. Over and over at other sites, it seemed that when teachers were given little direction, they became attached to something they understood and that made sense for the way they had been teaching. This kind of startup does not lend itself to teachers branching out at a later time. As mentioned in earlier reports on this site, there was no friendly software for these teachers to embrace. They had the initiative and professional pride to push ahead on their own, and they succeeded far beyond what one might have expected.

The kind of computer use exemplified, an example which was unique to this project among the seven sites visited by this evaluator, is replicable to a great extent. Leaving start-up to chance, however, may very well not yield the same positive results consistently. A saying which is advice to teachers for the first day of school is also appropriate when starting a project like this, "Well begun is good in the long run."

The recommendations made by the teachers in this site, when asked what they would do differently_if they were not constrained by the usage category are worth noting. According to these teachers:

The ideal hardware setup would continue to rotate the student computers on a daily basis (with flexibility as needed). Each teacher would have a computer at home, and each classroom would have a computer with printer and LCD.

Subject areas should not be limited to social studies, science, and math, but be expanded to include reading and language. The two fifth grade teachers feel social studies is the curricular area that can best be served by the project, while one fourth grade teacher favors writing reports and stories, and the other math.

When asked about the best use of the Mac, the two fifth grade teachers stated that they feel "Hypercard" is best, while the fourth favored word processing (bringing in "MacPaint," etc.) and also spreadsheets.

Students working cooperatively in groups of three or four with task division and focused toward producing a product was considered optimum student use. (Students working in pairs was also favored, but this was felt to be impractical with hardware limitations, space constraints, and moving computers.)

The following was offered as advice in starting up:

Let children explore the Mac's capabilities. This takes time, but is effective in real learning taking place. This happened out of necessity, as teachers knew little the first year. The second year, teachers felt they tended to skimp on this exploration out of eagerness to get more done. They now see they need to give time for it.

For new Mac teachers, spend a week before school starts in working and playing with the computers. This would be done in the morning, under the direction of an "expert," and in the afternoon, teachers would be on their own.

Weekly meetings among <u>all</u> implementing staff for sharing and support.

Conveying the idea to project teachers that it is o.k. to learn along with and from the students.

Set specific goals and timelines for computer use so it is directed toward specific outcomes and products.

Site:	**Laketon Elementary (North Manchester)**
Usage Category:	**Application Mini-Lab**
Site Visits:	**January 17; May 10, 1990**
Field Staff:	**Dr. Darryl Strickler**

INTRODUCTION

The initial phase of Laketon Elementary School's Microcomputer Project, which involved the use of eight Apple Macintosh computers with fourth-grade students in an "Application Mini-lab," was implemented during the 1988-89 school year in the "old" (c. 1890) school building. The 1989-90 phase of the project involved the use of 17 Macintosh computers and related software with third- through sixth-grade students in a classroom-size laboratory situation in the new, up-to-date Laketon Elementary School.

The objectives for both phases of the project were:

1. To use the computer as a tool for enrichment, creativity and productivity in math, social studies and science;

2. To improve teacher effectiveness through the use of utility software;

3. To promote cooperative learning;

4. To use individually-paced learning activities; and

5. To enhance problem-solving and higher-order thinking skills.

This report describes the use of Macintosh computers with two fourth-grade and two fifth-grade classes in the computer lab at Laketon Elementary School.

FINDINGS

Observation:

The ATI evaluator assigned to the project visited Laketon Elementary School on January 17, 1990, during the first week of the second semester and again on May 10, 1990, near the end of the school year. Using questionnaires specifically prepared to gather data on the project, the evaluator interviewed two fourth-grade and two fifth-grade teachers, the principal, and four fourth and fifth-grade students. Fourth- and fifth-grade classes used the computer lab one hour per day--four days per week, on the average--for supplementary activities related mostly to science and social studies. Hardware in the lab consists of 17 Apple Macintosh SE computers with hard drives and a dot matrix printer. The major software used was MicroSoft "Works" an integrated database, word-

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processing and spreadsheet program. "Printshop," "Springboard Publisher," "MacGallery," "Carmen Sandiego," and other programs were also used.

Students typically work in pairs at the computers doing specific assignments required by their teacher. Advance preparation for their work in the lab often takes place in the classroom or library. (There are no computers in individual classrooms.) For example, one class spent a great deal of time doing research on geographic regions of the United States before going to the computer lab to develop a "HyperCard" stack depicting what they found.

Fourth grade teachers appeared to make more specific, convergent-type assignments using "Works," while there seemed to be more experimentation, especially with "HyperCard" within the fifth grade classes--probably because of their extensive experience in the 1988-89 phase of the project when the fifth-grade students were in fourth grade. (Most current fourth-graders had no prior experience with computers.)

Teachers:

Because they participated in last year's CAI study during the 1988-89 school year, teachers at Laketon Elementary were very familiar with the usage category and objectives of their project and cited their prior involvement as a source of professional growth and "renewal," even though they were largely self-taught. Although the 1988-89 phase of the Laketon project was officially designated as an "Application Mini-Lab"--which was supposed to travel from classroom to classroom--all seven computers purchased with the initial grant from the state were permanently located in one classroom because of a variety of logistic and wiring problems in the old school building. The transition to the new lab with its ten additional computers and modern surroundings (and wiring) was, therefore, somewhat easy and went smoothly by all accounts. It should be clearly understood, however, that the Laketon project provides evidence on the effectiveness of "Computer Lab" usage category not the "Application Mini-lab" category.

During both the January and May, 1990 visits to Laketon it appeared that while the teachers had made phenomenal growth during the 1988-89 phase of the project, most appeared to have reached a plateau in their use of computers for instructional purposes. This is not as negative an observation as it may at first appear because all four fourth and fifth-grade teachers seem very knowledgeable, capable, and mutually supportive of one another's efforts. In short, they seem to "have it together." Furthermore, with virtually every project, it is seldom possible to achieve the kind of growth during the second year as was achieved during the first. With the effect of project initiation reduced and the flood of

visitors from last year slowed to a trickle, it was difficult to sustain the same level of growth.

There was little evidence of teacher professional growth in relation to how they used computers in instruction between the January and May interviews. For example, in January several teachers (and students) indicated that one of their goals was to learn how to use the scanner the school had purchased. By the second visit in May, they still had not learned how to use it. Another teacher indicated her desire in January to become proficient in "HyperCard" and to investigate CD-ROM and video disc applications, but by the second visit in May, she had not found the time to do so. As is the case in most schools, too many things compete for Laketon teachers' time and attention, and it is difficult for them to accomplish everything they intend to do.

Students:

From observations in the computer lab and interviews with individual students, it was apparent that Laketon fourth- and fifth-graders were proficient and comfortable using computers. Because of their more limited exposure and teacher-initiated assignments, the fourth graders seemed to be less creative in their use of the computers than the fifth graders during the initial visit in January.

During the May visit, it did not appear that the fourth graders had narrowed the gap at all, perhaps because the nature of their assignments, in general, seemed more convergent and task-specific, while the fifth graders seemed to have been allowed to pursue a number of self-initiated projects. At least the means they used to complete the computer-related projects they were assigned seemed to allow more room for their own initiative and creativity.

Individual students interviewed in January and May seemed coolly confident about their abilities to use the computer as a tool and did not appear to think of it as a "big deal." This attitude seemed prevalent throughout the fourth and fifth grades and appeared to be an artifact of the teacher's effective approach to the use of computers.

SUMMARY

The overall picture of Laketon's computer project during the 1989-90 phase is one of successful and effective use of technology. The principal, teachers and students have a clear sense of having accomplished what they set out to do: use the computer as a tool to assist learning and problem solving activities, and as a creative means to organize and present information. Whether there could have been more progress toward new and innovative uses of the

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computers during the year is still an open question, but there is no doubt that what has been accomplished is significant and worthwhile.

SELF-CONTAINED

Site:	Highland Terrace (East Allen)
Usage Category:	Self-contained
Site Visit:	February 27; May 23, 1990
Field Staff:	Dr. Beverly Farr

INTRODUCTION

This is the fourth year of operation for this self-contained site. In the evaluation last year, it was noted that the project had "experienced quite a lot of change...even though it was in its third year." There was more sophisticated use of the computers, considerable process writing, extensive use of an image projector, and explorations in the use of database and spreadsheet capabilities. During the current year, there did not seem to be much change from last year's program. It seemed, in fact, that there was not as much variation and sophistication as there was last year.

The students still work independently at the computers, moving from teacher-directed instruction or seat-work activities to computer work as the teacher directs. The teacher presents a specific lesson to half of the class, while the other half of the group works on something at the computer; then the groups switch. It seemed that part of the reason that there was less advanced use of the computers this year was the nature of this year's group. The teacher commented repeatedly on the problems presented by her class this year. It is a large class with 33 students, including times when there are seven LD students; one regular student is over-age for the class and has been recommended for special evaluation. The teacher felt that she just could not do many of the things with computers she had done in previous years, and she did not venture into any new territory.

FINDINGS

Observations:

During both visits, the students were engaged in the regular classroom routine for this site. The evaluator was present for several hours each time. An instructional lesson was presented by the teacher to half of the class, while the other half worked at the computer. In the first case, she gave a science lesson, and the students at the computers were given a choice of several science programs from which to choose to work on. (The computer programs were not related to the science lesson presented.) The students had some difficulty with the optional programs. Most did not seem at all familiar with the programs, did not bother to go through any informational tours, and when they could not figure out the program, went on to another or asked another student for information that would help them proceed. (The teacher explained afterward that she realized many of them had not been exposed to

the programs but wanted to see how well they could do with figuring out how to proceed.) It seemed that they were not capable or had not been given enough opportunity to explore on their own to follow through using this approach to a task. This might have been a good time to have them work in pairs, but it is doubtful that the noise level would have made it possible for the teacher to continue teaching.

During the second visit, students worked on a problem-solving program that was familiar to them. It required taking data about objects and figuring out which one had been selected on each turn based on the data. They wrote information on printed forms that had been given to them to provide documentation of the process they had followed. Most proceeded without difficulty. All of the programs used during the first and second visits were available on the network, and students had no problem getting around in the computer and finding the right program or level. This was noteworthy in this site: students were obviously very comfortable using the computers and managed the software quite well. It's clear that the substantial amount of independent time they get at the computer has allowed them to become quite facile with the hardware and software.

Teacher:

Goals. The teacher specified her main goal this year was to become familiar with the modem and to use it extensively to communicate with others in the project. This did not really happen to any extent. Her goals for her students included getting them to function independently, acquire basic knowledge of computers and feel comfortable with them, and to figure out new pieces of software without help. While the first two seemed to have been accomplished, the latter was not as successfully attained. The teacher attributes that fact to the immaturity and difficult characteristics of this particular class of students.

Instruction. This teacher felt that it "really helps when textbook material can be put on the computer; they have to respond individually, not randomly." She indicated that she did not have trouble getting them to complete computer assignments. She felt that she had the most difficulty at the beginning of the year--getting students to listen and follow directions, developing independence, helping them become familiar with all of the software available. (The software has been carefully organized in notebooks that are left near the computers.)

The teacher has attempted to integrate the computers with all content areas, providing follow-up to instruction. This has worked better in some areas or with some topics than with others. In some instances, she merely has them work through a program or programs that are related to the general subject area, but not the particular topic being presented. While this always gives them the

opportunity to develop an awareness of the subject area's vocabulary or concepts or to develop problem-solving skills, it is not necessarily follow-up to the lesson being presented the same day. This may result in some fragmentation or counter-productive activity for students. While they may be good, interesting programs, it may become little more than "busy work" if students aren't making connections and developing conceptual awareness in a coherent way.

The teacher has developed study guides in science, health, and Indiana history, including a vocabulary program or crossword puzzle for all units. Students work on these independently. Questions for the units are entered on the computer, and students review for tests using these questions. They have also done some writing--newspaper stories, and they made books. The stories were written first and then keyed in; they made covers and title pages using Print Shop. The teacher liked having the network fully functional this year, particularly for the writing because they could store their writing to the hard drive. (The teacher found it particularly bothersome not to have two disk drives.)

Students had not developed keyboarding skills to any significant extent this year. The teacher tried to make sure they knew the home keys and that they used a two-handed approach, rather than two fingers. She felt, however, that it was too much for this class to concentrate and attend as much as needed to gain mastery of the keyboard. It would seem, however, that in a self-contained site, this is one of the skills that should be emphasized.

The students were also engaged in reading activity software that accompanied the basal reader, in word attack activities, and in spelling. The teacher has been using a cooperative learning approach known as CIRC for the second year but found that this class had severe difficulty with the team activities required for this approach. As a result, they worked independently on the reading program from the basal.

According to her responses on the interview probes regarding instructional and support uses, the computers were used extensively for drill and practice or tutorial and student word processing; they were used moderately for simulations, thinking skills software, and keyboarding instruction; and they were used a little for teacher demonstration, programming (basic Logo), and database (Appleworks). The teacher used the computer extensively for classroom management (grades, reports, tests), word processing, and database or spreadsheet development. These results are in keeping with the other self-contained sites.

Effects on Teachers. After four years, this teacher still felt that the computers had been a great boon to her teaching. They "made it a lot more exciting to teach," according to her comments in the interview, because before she had felt "burned

out". She did not feel that it saved her any time or work, however, because she is still always thinking of or working on new things to do. She feels that she has always been fairly organized, but that computers really force her to structure her day to integrate computer use.

Students:

Attitudes/Achievement. The most significant impact on student attitudes that this teacher mentioned was their development as independent workers; they completed computer assignments much more readily than other written assignments. She felt that computer use had enhanced their spelling skills, since "things have to be spelled correctly." It had developed their research skills. She noted this particularly when she traded classes with another teacher; the other class had no research skills and were not nearly as independent.

The responses of the students in this site to the interview probes were interesting with regard to what makes the computer fun and what makes it difficult. To the former, they all responded that it gives you a lot of practice or you "get to play games"; several mentioned the advantage of not hurting your hand by writing things out. These responses seem to reflect a restricted use of the computer in terms of application, creative thinking, and problem solving. When asked about what makes it difficult, they referred only to "finding the right keys," doing crosswords, or "finding help". Several responded that nothing was difficult, and when asked what they would still like to learn or do, most had no idea; only one said he would like to make his own game. These appear to be the responses of children who have been more or less "programmed" on the computer, not ones who have seen the unlimited potential for versatility and creativity. This is, indeed, a subjective observation, but one has only to read the responses by students who were in sites where application, demonstration, or problem solving software was used more extensively to note the differences.

These students unanimously agreed that they preferred working by themselves, an interesting fact when noting that they worked independently at the computer almost 100% of the time. When asked for reasons, they gave many strong responses, such as "Nobody's there bothering you"; "Your partner might not know the answer"; "A partner always tells you what to do, pushes you around"; "It's easier because I don't like it when they tell the answer." These responses are interesting, but it is difficult to conclude whether it is a result of this being a difficult group (as indicated by the teacher) or whether they just did not have enough opportunity to work together to solve problems (rather than just finding "the answer"). Students in sites where working together was much more common saw many advantages in doing so.

Instructional Activities. Students reported doing most of their computer work in the areas of word and number games, science, social studies; a moderate amount of use in math, writing, keyboarding, spelling, problem solving, and textbook questions; they did the least in database, and experiment or demonstration. The second visit results showed slight decreases in math, social studies, database, and problem solving. By comparison with other sites in the usage category, they seem to do less word and number games, keyboarding, database, and experiment or demonstration, but more science.

Student responses to what they liked to do best on the computer reflected strong preferences for games ("Number Munchers," "Speedway Math," "Spellevator"); a few liked Logowriter, and one specified "Oregon Trail". All of the students indicated that they had written stories (always on paper first); the number increased from one at the first visit to two-three at the second visit. They also mentioned writing their "book" on the computer.

SUMMARY

It would seem that the safest statement to make about this site after four years is that this year constituted a "plateau year". Much of the same work was accomplished (with somewhat more ease because of the network being in place); nothing new was accomplished. New territory was not explored, nor were alternative approaches attempted. Much of this was due to the nature and size of this year's class. It is difficult to say whether it was merely the teacher's perception of this class that hampered progress or whether the group itself precluded the accomplishment of more. The research shows clearly that teacher expectations determine educational outcomes; perhaps more could have been done to use the computers as vehicles to engage this group and forestall problems, but this is difficult to say for certain. The site is well organized and equipped, but one might hope that after four years the teacher might explore alternatives to always teaching each lesson twice.

Site: Oak Hill Elementary (Tri-Creek)
Usage Category: Self-contained
Site Visit: January 25, 1990
Field Staff: Lou Emge

INTRODUCTION

The project is functioning exactly like last spring with a classroom teacher, a full-time computer aide, and an Apple computer lab in the back of the room. The teacher teaches half the class, while the other half works at the computers under the supervision and direction of an aide. Computer use is well-organized and centers around writing using "Fredwriter," Macmillan reading software that goes with the basal, math computation practice, a little science, and other miscellaneous software. There is a printer connected to clusters of four computers, and the printers serve as an important part of the computer use.

Generally speaking, the computers are used for writing and computer-assisted instruction. There are few attempts to break the pattern of 1:1 computer use or to involve children in problem-solving, experimentation, and creativity. To date there has been no spreadsheet or database use. After four years of involvement in the project, the uses of the computer have stayed extremely limited and narrow.

The screen projector which was added last year is receiving considerable use this year, primarily for introducing new software. One change not directly related to the project is the involvement of other fourth grade classrooms during the last hour of each day. The computer teacher takes his class to another classroom and those students come to his computer-equipped classroom. Other fourth grades come in once per week.

FINDINGS

Observation:

Half of the students in the class were at their computers finishing letters that they had started the day before. Students routinely put their name and the date in the upper lefthand corner of the file. The form for letter writing had been introduced the previous day using the large screen projector and a single computer. Students used keyboarding better than most sites and routinely printed the letter and turned it in. After they finished, they chose software from an individual schedule that they keep in their computer folders. Last year, a single schedule, a matrix of software divided by topics and student names, had been on the wall, and stickers were placed in a cell when the student completed the assignment. This year the schedule is on paper for

each student and is kept in each student's computer folder. Students have choices from within the general schedule set by the teacher.

"Fredwriter" is used effectively for word processing by the students. Each student has the list of commands taped inside her/his computer folder for quick reference. It seems as though the students have done enough keyboarding and the word processing program to use it effectively, concentrating on the writing process rather than on the hardware and software.

In an interview with the aide, it was reported that they use the software that accompanies the Macmillan basal reader. She feels the software is better than the workbook because of the graphics, game element, and immediate feedback. Again, this is a very traditional use of the computer for instruction/practice.

Teacher:

The teacher has completely routinized computer use in his classroom. He started four years ago with some ideas for using the computer and has fairly well reached the point where he wants to be. He is eager now for the computer emphasis to end and for his classroom to be more traditionally textbook-driven next year. If his students would never have access to computers again, the only things he would really miss would be using the computers for writing. In observing, his students do a very good job of touch typing, using the word processing package, and being able to create and edit at the computer. He also said if he had one computer, he would use the overhead a lot.

The teacher has a great deal of computer knowledge and experience, plus a wealth of software knowledge. He has been in somewhat of a routine on computer use and really hasn't looked for innovative ways to use the computer for problem solving, simulations, group projects, etc. He has good software, a well-organized classroom, an aide to supervise the computer students, and a well-equipped lab in the back of the room. He stated that having computers makes the teacher's job easier.

The principal mentioned that the other fourth grade classrooms rotate into the computer classroom the last hour of each day--giving each teacher about an hour per week. The principal was very proud of this as showing that enthusiasm for using the computer was spreading. However, the computer teacher was rather negative about this, saying the teachers treated it like any other extra activity like P.E. or music. They brought their students to the room and stayed in the front with half their students while the computer aide worked with the other half. They switched groups for the second half hour. Teachers are asked for input into the kind of computer activities they would like their students involved in each week. The principal reported that the teachers have not given much

input or showed much interest. Apparently, the computer aide chooses activities almost all the time. The classroom teacher generally stays in the front and doesn't even wander back to see what the students are doing on the computer, presumably because they wouldn't know enough to help anyway.

It is interesting to note that when a model or structure is in place, it is difficult for teachers to deviate from the model presented. The other classroom teachers follow the model of computer use that is in the project classroom. The aide takes care of the computers, and the teacher takes care of the front of the room. The project teacher has done a tremendous amount of work getting the model in place, and now he has a hands-off attitude toward the computer use of his students.

Students:

The students interviewed all liked different computer activities; one liked writing stories; another liked the reading disk (that goes with the basal) and the suffix game; a third student liked "Ace Reporter" where there are clues, and you try to solve it. Students report writing a number of stories. The students liked using the computer because it saves time and is easier than writing. One student said it makes you read a lot, which has been a benefit recognized by the teacher throughout the project. The teacher feels there is a great deal of purposeful reading taking place when the students interact with the computer. Reading gains were the highest in an earlier evaluation of the project.

Two of the three students interviewed said they would prefer working with a partner at the computer, rather than alone which is the usual mode of operation. The usage category description talks about alternating half the class on and off the computers, but it seems like after four years, there might be more variation and recognition of the benefits of students working in groups.

Student responses to what they have been doing on the computer showed a great deal of activity in many areas. The well-organized classroom and computer program, a well-equipped computer area, plus the aide, give children a great deal of quality computer time within the limits of the usage category and the choices of the teacher.

There were no database or spreadsheet activities to date. The teacher talked of these again, and the evaluator will be looking for them in the spring. Databases and spreadsheets do not fit into this project's mode of operation, which is running software and writing. There were no surprises in talking with the three students.

SUMMARY

The major benefit from this project is the inventory of software that was used in the project. In other reports, the "search for magic software" has been mentioned as a strategy used by some teachers who feel that if they somehow find it, all the challenges of effective computer use in the classroom will be met. This project seems to have come closest to finding "the magic software". Through many years of hard work, this teacher has identified some effective software to use in this model, and that (plus a full-time aide) helped to make things easier.

This site doesn't seem to have much to offer as a model. The high cost of twelve computers and three printers for 24 students and the full-time aide make it very expensive. Additionally, the uses of the computer are very traditional. Students effectively use the computer for word processing and printing, but the writing activities are quite traditional, compared to what is currently emerging as implications of the research on making reading/writing connection and whole language instruction.

Site: Oak Hill Elementary (Tri-Creek)
Usage Category: Self-contained
Site Visit: May 4, 1990
Field Staff: Lou Emge

INTRODUCTION

The twelve apple computers in the back of the room were being used in a similar fashion as on the first three visits. The computer aide supervises and assists students working at computers, while the teacher works with half the class in the front of the room. On the first three visits the teacher was doing very traditional lecture/discussion teaching. On this visit, he was using the single computer and LCD projector for whole-group (actually half the class) instruction and problem-solving. These were the most innovative uses of the computer that have been observed at this site.

As described in detail in the January report, student computer use is well-organized, students are very proficient in using the computer, the software is carefully selected, and printing is a big part of the project. Almost all uses involve students 1:1 with the computer in writing and tutorial/practice activities. They are all very traditional uses of the computer.

There were no observed changes in students' computer use in the back of the room. There was a definite change in the teacher's instruction with his half the class in the front of the room. He was using, for the first time that has been observed or mentioned, a single computer with the LCD projector for large-group instruction on problem solving.

FINDINGS

Observation:

What was observed in the computer area was as described before--well-organized computer use centered around writing and tutorial/practice activities which are directed by the computer aide. Some of the software being used was "SRA Math". In watching a few students using the software, it seemed a very poor approach to reinforcing the multiplication of whole numbers.

A pleasant surprise was seeing the teacher use tutorial software in the front of the class with the group. The tutorial was very traditional and little more than an instructional page from a text. However, he had students take turns at the computer, advancing through the software as the class discussed. The teacher kept the rest of the class focused on the wall projection. It worked nicely as he guided the progress through the software by

asking questions, stopping to bring out points of emphasis, etc. The software seemed to have good content but would have been much less stimulating if used students used it independently. This instructional approach seemed better than teacher-directed instruction alone or having the students use the software individually. It also was timed to fit exactly into the regular curriculum.

The other large-group computer activity was a math game, "Teasers" by Tobbs, from Sunburst. The group was divided into two teams, and a computer operator would enter the team's response to find where numbers went in a grid. This same software was discussed in another site in terms of its effectiveness for problem solving in mathematics. It also provides good practice in mental computation.

In observing these two computer activities integrating computer use into the "front" of the room, there appeared to be a sense of enthusiasm on the part of the teacher which had not been seen before. The other visits had been quite routine, with the teacher showing a high level of competence within traditional computer use, but little excitement about what was going on. He seemed, in this instance, to be proud of involving a larger group of students with the computer. Previously he had used the LCD projector only to show students how to use new software. This expanded use of the single computer should be valuable to him next year, when the twelve computers go into a central lab. He will probably only have a single computer in his room next year.

<u>Teacher and aide:</u>

At the January visit, the teacher said a goal for computer use this year was that students would write better. As observed and reported, his students do an excellent job of keyboarding and creating at the computer. He specifically wanted a better flow of ideas, better sentences, and proof reading. At the May visit, he said he is still working with this. Higher ability students are doing a good job, but lower ability students are not. This evaluator feels that he has high standards for fourth grade and that he has done much to improve the writing of his lower-ability students.

He said that changes that have occurred in his regular teaching include using the computer to teach concepts and stressing more language arts and math, perhaps at the expense of science and social studies.

The two biggest benefits to his students are feeling comfortable and learning with technology and learning responsibility and independence.

Databases have not yet become part of his computer classroom. During the January visit, he indicated that he still was intending to get into them this year. He is the kind of teacher who, it would seem, could do a lot with them if he could ever get started. He has a hard time getting out of the comfortable "rut" of computer use he has adopted and perfected over the last three or four years.

An activity which the teacher said he has done in the past is the "Computer Mini-Olympics". Events include keyboarding, math, "Oregon Trail," "Science--Heat and Energy," and "Cross-Country USA" (a truck driving simulation). Apparently scores can be derived from each of these activities, and awards are given out the last day of school. He talked very positively about this.

The evaluator and the aide discussed the other teachers bringing their classes in the last hour of the day once per week. The aide was still negative about this because of the teachers' "hands off" attitude toward the computers. They did not get involved with their students using the computers.

Students:

The evaluator asked the students about the "SRA Math". Two said it was "o.k.," and third didn't like it. The two that thought that the "SRA Math" was o.k. did mention math games as one of their favorite activities. The third mentioned programming an Easter picture. This involved making a picture on graph paper, then plotting it on the computer. With the directions put into the computer, the computer draws the picture. Individual student programs were included on a general class disk that the evaluator reviewed and concluded was an excellent idea of reinforcing student work and computer capabilities. It was like a class booklet of the pictures, but on disk. The student who discussed this activity also talked about doing things at home on his computer that he learned at school. One of the other students talked about programming her name and wanting to do more of this kind of thing. Writing was a big part of student computer use. They talked mostly about using "Fredwriter".

When students were asked about how they would use the computers if they were the teacher, one said a separate lab, and two said a computer for every student. There weren't any other significant suggestions.

SUMMARY

As stated in the previous report, this site has little to offer as a model for computer use. The twelve computers and three printers in a single classroom and the full-time computer aide in the classroom make it quite unrealistic for a typical school.

The teacher has a wealth of information about the content of software and could be a valuable resource in learning about software. He also employed good management techniques (appropriate for his setting, but not necessarily something that all sites could benefit from) such as student folders that contained a weekly list of activities students could choose from and space to track what was accomplished. The folders also had information about "Fredwriter" inside the cover, a handy reference for students who used this word processing software a great deal. Also, all of his software was organized into curricular areas and also fit into the sequence of the curricular area in many cases. If a goal of computer use is computer assisted instruction and practice, his well-organized software would help accomplish this goal.

The project valued the printing of student work, which became part of the student's computer folder. An increased understanding of the value of printing would be beneficial to many of the sites.

Site:	Rockville Elementary
Usage Category:	Self-contained
Site Visit:	January 17, 1990
Field Staff:	Lou Emge

INTRODUCTION

The site is in its fourth year of implementation. There are twelve Apples around the perimeter of the room, with the student desks clustered in the center. There is a lot of trading of students among the fourth grade classrooms, so it was difficult to figure out what students were getting what computer time. It was not as might be expected, with one teacher keeping her own class of students all day. Apparently they re-group homogeneously for reading and math. This does not have a lot to do with the activities going on in the classroom, but does have a bearing on student scores and responses because her homeroom is not necessarily getting the "full treatment".

Consistent with the objectives of the usage category, computers are used for all subjects and are operated for the majority of every school day. The teacher has software and/or other activities to use in all areas of the curriculum. During the more than three years of the project, she has continued to develop diversity of computer uses for instruction. Computer usage is a regular part of the classroom routine, not an event.

The usage category specifies that students will use computers 50% of the time. To do this, when the majority of computer use is 1:1, requires almost full time utilization. As reported last year, a significant amount of student time on the computer is used to complete textbook exercises, many of which are single-letter responses or copying a sentence and choosing the correct form of a word. These exercises could be done as easily with paper and pencil.

The school has a large number of computers in addition to the fourth grade self-contained project. Other computers include: K-1st IBM "Write-To-Read" lab; 2nd-3rd lab with 15 Apples; and, a 4th-6th Apple lab with 25 computers. Also, most classrooms have computers in them. The teacher feels the seed for this extensive use in the school was the grant from the state. The principal reported that there was a lot of computer interest prior to the grant, but that the grant had certainly influenced the rapid growth of computer use.

The project appears to be functioning much like last year. As mentioned, the teacher continues to improve in using software that fits the curriculum, cooperative learning, and student-centered activities.

FINDINGS

Observation:

Children were working in pairs on a math measurement program that largely involved computation. It was working nicely, and the pairs of students apparently switched roles every day. The teacher reported that they use a lot of MECC software.

Teacher:

The teacher expressed much satisfaction in her involvement in the computer project. She said she feels better about her teaching and feels like what she is doing is the right thing. The computer project has evolved into a more relaxed, positive classroom environment which is much more student-centered than before. She reports using cooperative groups more in her non-computer instruction as a result of her involvement.

She reports that the students are capable of, and comfortable with, written expression. Computers tend to meet students' individual needs, for both high and low achievers. She reports that the objective that is most effectively met is involving students in individualized learning tasks. Keyboarding is an area that is not being done effectively. Keyboarding to any degree of proficiency has not occurred in many of my sites. If keyboarding is a high priority and the goal is to accomplish some degree of automaticity, students have to have intermittent practice and constant reminders and reinforcement throughout the year, not just for the first six weeks. This naturally takes time away from other activities and is apparently the reason for sufficient time not being taken. If there were a coordinated computer usage curriculum that spanned the grades, it would seem more likely that teachers would take more time. They would know their students would be having computer opportunities each year, not just for the one-year project.

A personal goal for this teacher was to enter all tests, worksheets, etc. into the computer for students to use. This is consistent with her priority of students using the computers as much as possible. Students use the computer in all areas of the curriculum to varying degrees. Indiana History software is used extensively. Process writing using various software is a big part of computer use. Word processing and writing activities include journals, spelling sentences and stories, taking tests, writing out text exercises, and creative writing. She wants to use desktop publishing to do a class newspaper this year. Use of the computer for science would be greatly enhanced by the addition of an LCD projector for whole-class demonstration.

The teacher feels that her students are much more positive in general because of computer use. They are more willing and more

creative in written expression and editing for spelling. They are also more organized, mindful of responsibility, and comfortable in helping each other. The computer tends to "force" students to bring closure to activities.

The teacher likes the hardware and software. She would like a Macintosh, an LCD projector, and more of the computers hooked to available printers. The teacher reports extensive use of the computer for instructional support. This includes grades, tests, other word processing, a little in database and spreadsheet, graphics (which were evident in the room) and desktop publishing. She would like to have her lesson plan book on the computer. These varied uses have evolved over the several years of the project.

Students:

Two of the three students interviewed particularly liked using "Oregon Trail". One of these also liked "Wheel of Fortune" and "Tic Tac Show" software. The third student liked the Milliken word processing software best, particularly in writing her own diary and printing it out. Two of the students reported writing one story so far, and the third had written about six, but most of these were ones other students didn't do. One student said he would like to make a banner.

The students had different reasons that they felt using the computer was fun. One student said it is nice to have the computer "teaching" sometimes, instead of always the teacher. Another said it made things easier, and he likes school better because of computer use. The third felt it made learning a game, particularly in math and science. Students reported difficulty in knowing the keyboard, the most common difficulty in all of the sites. Students did not show a strong preference for working alone or with others at the computer.

The computer use that all three students reported a high amount of was in practicing spelling words. When there are more than a few computers available, and the teacher does not have a lot of real creative computer uses as a high priority, the spelling sentences are usually a weekly event. It follows the curriculum exactly, gives students a chance to create sentences and sometimes stories, and gives them an opportunity to practice their keyboarding skills. They also reported moderate use in almost all of the areas, which is consistent with the extensive time students use the computer and its use in most subject areas.

SUMMARY

The project continues to involve students in using the computer from 40 to 50% of their class time. Although some of the use is rather routine, the teacher seems to be continually looking

for better ways to involve her students in meaningful computer activities. Her "wish list" includes a Macintosh, LCD screen, and more computers hooked to available printers--all things that can lead to even more flexibility and effectiveness in using the computer.

It would be interesting to give a Macintosh to an experienced computer teacher, along with the LCD, and see if the kinds of uses that are so successful at some of the other Mac sites could be integrated into the more traditional computer uses of this classroom.

Site:	Rockville Elementary
Usage Category:	Self-contained
Site Visit:	May 10, 1990
Field Staff:	Lou Emge

INTRODUCTION

Computers are being used in a similar fashion as before for most of the time. Each student gets, on the average, more than two hours of computer use per day. Students working 1:1 at computers, with the other half the class involved in seatwork is the primary mode of operation. There is some 2:1, 4:1, and whole-class use as well. Students were observed working in groups at the computers, student-directed class use of a single computer for instruction and reinforcement, and teacher-directed use of a single computer for introducing software and concepts. What was observed was not typical as the evaluator asked the teacher to show activities that she felt were particularly effective uses of the computer in her project, not necessarily the ones used most often.

There was little change in use from the last visit, except the use of whole-class activities. Coincidentally, both of the veteran, self-contained teachers that were visited by this evaluator demonstrated two large-group instructional activities at the last visit. They had not ever mentioned large-group activities before, except to introduce new software.

FINDINGS

Observation:

Three activities were observed during the visit. The first activity involved the entire class. They were studying Indiana government in social studies and were using software specific to Indiana government. One student sat at the computer, and another directed the class discussion and called on students for answers to follow-up multiple-choice questions. The teacher stayed in the background mostly, but did bring in some current-event discussion because of Parke County elections the week before and an anticipated visit to Indianapolis, the state Capitol, in a few days. Most of the students remained attentive. Their attention was directed toward a computer monitor which is quite small for full-class viewing. Apparently the teacher has access to an LCD projector, but chose not to use it. It was a worthwhile activity and a good group use of the software.

The second activity observed was students working in pairs on science software, "Chem Lab" by Simon & Shuster. Students perform experiments on the computer, combining chemicals to get the proper combination or reaction. There are worksheets that accompany the activities. The software contains 50 experiments, and students on

this day were working on #'s 31 and 32. They do this quite a bit. Each of the three students interviewed named "Chem Lab" as their favorite activity. A teacher log on "Chem Lab" noted that children learn a lot and gave an example of a student explaining a particular chemical reaction to a visitor from another school.

The third activity occurred the last five minutes of the school day. The teacher assembled the class around a computer station and introduced a lesson from "Science Toolkit" to be expanded on the next day. The experiment centers around using a thermometer probe hooked to the computer and measuring temperature changes from various chemical reactions. She introduced the terminology of "exothermic" and "endothermic" also. This was an excellent introductory lesson for the main lesson the next day.

Teacher:

The teacher talked of her involvement with the computer project over the last four years. It forced her to look at learning behaviors and styles and to be more creative in approaches to meeting student needs. She also learned to appreciate children as teachers. Recently, kindergarten teachers have been bringing their classes to the fourth grade room to use the computers. The fourth graders teach the kindergarten students. They have done this several times and it has been a positive experience for all. A log described the activity in more detail.

The teacher feels as a result of computer involvement that her students are better thinkers and problem solvers. They are more creative, have higher self-esteem, and are more positive about education. If her feelings are accurate, this is a very successful project. Her regular classroom instruction, although with the computers in the room much of her instruction is related to computers, involves more cooperative activities, and she allows students to plan their own instruction more often. She is in the role of facilitator of learning more often than in the past.

She described some non-traditional classroom computer uses such as building databases using "Facts Works". She described a tag-along story in which the group chooses a familiar fairy tale character. One student writes a sentence involving the character. The next person adds a sentence to start building a story. Each student independently adds his or her own sentence.

One of the logs completed by the teacher described using "Super Print II" to create and print graphics for pre-writing stimuli. After completing a poem, they illustrate it using this software. This was done over a two-day period. Another described students using "Word Attack Plus," which consists of three levels of adjective lessons. She said the levels made it particularly useful to meet various student needs, and all were working eagerly in the arcade game format of the program.

An excellent activity she described involved Indiana history and "Backyard Birds" software from MECC. She described it as a field trip at computer stations as children worked with complete concentration to systematically identify birds at three levels of difficulty. A follow-up activity was to search for material at the library and create a database about animals in Indiana.

Another project described involved using three different software programs to produce a shoebox diorama. Children are involved in thinking about the many aspects of a healthy environment to include--health care, recreation, homes, trees, places to learn, places to work, etc.

A log described an activity from last September in which there was a "Child-Parent Night" focused on the family budget using "AppleWorks". "Child-Parent" nights occur weekly, with half the class alternating weeks. She said it was very successful, and a follow-up class activity was for children to have a "pretend" checking account and write checks and keep records on "AppleWorks".

Another "Child-Parent Night" involved the children reading aloud a report on the Iroquois Indians and following this up with creating an outline of main topics and subtopics using "Children's Writing and Publishing Center". Graphics were included in the finished product. The teacher took a back seat in this activity, and the parents were very impressed with what they and their child could accomplish.

From the interviews, observation, and logs, it is clear that the teacher was an excellent and energetic classroom teacher before computers and has developed many good computer applications to enhance classroom instruction. Of particular note, is the careful planning of activities with introduction and follow-up.

Students:

All students interviewed reported writing a lot with the computer and liking "Chem Lab" the best. One student talked about wanting to do "Oregon Trail" more, and another talked about databases which they had used only a little. The computer uses that they reported being involved in and the way they would do things if they were the teacher did not differ appreciably from what has been described in other parts of this report. All three said they would do things about the same way as they are doing them now.

SUMMARY

Twelve computers in a single classroom is not the kind of model that many school districts would be willing to adopt. However, the teacher has learned much about flexibly using the

computer for instruction and demonstration, the use of specific software, and successful ways of involving parents on an ongoing basis. She describes projects in which students use different software to create a product. She describes careful attention to introducing and following up computer activities, rather than over-emphasizing the activity itself.

One of her goals has been to have the computers used 100% of the time that students are in the room. In working toward this goal, she has incorporated some "busy work" activities with the computers, such as completing single word-answers to textbook sets of exercises on the computer. She had also set as a goal for the year to get all of her tests and worksheets on the computer. She reports having accomplished this.

This teacher could be an excellent resource to other districts starting or increasing classroom computer use. She would also be valuable in describing, either in writing or in workshops, the best software and projects she has involved students in. Her work involving parents can also serve as a model for others.

BUDDY SYSTEM

Site:	Indian Creek (Lawrence)
Usage Category:	Buddy System
Site Visit:	January 26, 1990
Field Staff:	Lou Emge

INTRODUCTION

There are two aspects to this usage category--students have IBM computers (no printers) at home, and there is an IBM lab for classroom use at school. There are two fourth grade and two fifth grade classrooms involved in the project. The two fourth grade teachers were also involved in the project last year so are in their second year of implementation. The two fifth grade teachers are new to the project this year (but have been at the school a number of years); many fifth graders, though, have considerable experience from last year.

Student use of computers at school seems to vary between the fourth and fifth grade. The two fourth grades use the computer lab more and for more varied reasons than the fifth grades with the teachers new to the project. The fifth grade teachers had had about a semester in the project at the time of the first visit, while the fourth grade teachers had had three semesters.

Student use of computers at home and their involvement with computers in the classroom and lab are not closely tied in most cases. Limitations of available software and the lack of printers at home have kept structured computer use to a fairly low level. Using the computer for word processing is the biggest at-home use. But without printing capabilities at home, the sense of accomplishment from composing and printing a draft is lost or at least delayed until the next day. The amount of time that students are reportedly using the computer at home for school assignments and activities is probably less than 30 minutes per day for four days a week.

The principal said that supplying hardware, a little software, and a little training does not give one a "vision" for how technology will fit into the curriculum. For a home-school coordinated use of computers to be effective, it takes much time over an extended period and a great deal of creativity and expertise. The simultaneous development of uses of the school computer lab and the home computers of the students is really multi-faceted. The integration of computer use must be accomplished at the same time that there is an integration between school and home use. This is not easy to accomplish without considerable effort, collaboration, and time.

There are many good uses of computers apparent at this site, both at school and at home. This is a credit to the hard work and creativity of the staff involved. The school is "pro technology,"

so the project operates in an environment which encourages teachers to try things.

Last year, there were four fourth grades involved in the project. This year there are a group of fifth grade students who were involved in the project as fourth graders, and are entering fifth grade classrooms where the teachers are new to the project. As might be expected, fifth grade students are experiencing less variety of computer activities than they did at the end of last year. They also report not using the computer at school as much as they had the year before as part of the fourth grade project. Fourth grade students report using the computer a lot more than the previous year.

FINDINGS

Observation:

Because of the half-day format of the visit and the nine interviews conducted, there was minimal observation of students using the computer lab.

Teachers:

The two fifth grade teachers are new to the project. Both are experienced teachers who seem to be good teachers, but are feeling some frustration with their first major involvement with technology for their students. As mentioned in the introduction, the task of coordinating and integrating home and school use of computers with an existing curriculum seems formidable. Reading the educational goals, objectives and assessment strategies for the usage category might be discouraging to any classroom teacher being asked to implement the project with limited time and training. One of the teachers described her feelings as "cooking before you have the recipe."

What the two teachers are feeling is not much different from that reported in reports from fall visits for the first-year projects last year. These two teachers are in their first year, but unlike projects last year, many of their students are much more experienced than they are. This adds to their sense of frustration in not getting "up-to-speed" as quickly as they might like. But as has been shown from last year's experiences, it takes time to get things going. These teachers might, in fact, be ahead of where most first-year projects were at this time, but they probably have higher expectations because of the project's existence in fourth grade last year. They have likely learned both from their experienced colleagues in the fourth grade and from their students, an advantage that would not exist in other projects just being initiated.

One of the fifth grade teachers expressed as a goal that his program carry the students' fourth grade experience into a smooth two-year program. Both of the fifth grade teachers were interested in learning more about the software and how to use it effectively in instruction. One of the teachers has as a goal for her students to be involved in developing projects using statistics, simulations.

To this point, fifth grade students are involved in both math and language reinforcement using software that goes with their texts. Also word processing is used for writing. One teacher uses "Prodigy" for building content background and the computer for paragraph development. She reports the students came with good word processing skills. One teacher gives students the option on at-home written assignments of using the computer or handwriting. The real advantage to word processing at home is diminished somewhat by the lack of printers. Spelling is also an area for which both teachers use the computer. Both teachers report limited use of computers for science because the level of software is above fifth grade.

The fifth grade teachers reported their students probably use the computer about one to two hours per week at home working on assignments and other activities directly related to school. One student said they went every day for 45 minutes. Another student from the other fifth grade said there were times they didn't go to the lab for two weeks.

The fifth grade teacher found the training helpful and was particularly happy with the released day that was provided for working on computer development. The other teacher was not as pleased with the training and feels there needs to be more planned training over the summer. IBM has been responsive to requests for assistance during this year, she reports.

The two fourth grade teachers who are in their second year in the project are expanding on their first year experience. Both feel they have experienced a great deal of personal and professional growth because of their involvement in the project. By the end of the last year, one reported being able to see the "big picture" of computer use. One teacher reported she is a better manager of her teaching life and makes things more enriching for her students with less work. The same teacher said that last year during the last nine weeks, she could really see the fruits of her labor with the computer as she felt she was much more productive.

Goals for the second-year teachers were much more specific. Both wanted to learn more about databases and spreadsheets and integrate their use into the curriculum. One of the teachers has as a goal more parental involvement. Both teachers want their students to become proficient at keyboarding. One teacher stated

she wants her students to see how computers are used in the real world, not just for fun.

Currently, fourth graders are using computers for enrichment in science and social studies, math tutorial and reinforcement, and word processing and process writing. One teacher sends home a disk with program(s) that are targeted to the weaknesses of the students. Besides writing, this seems to be the closest connection with the classroom that the home computers are being used for.

Fourth graders are involved with some cooperative learning activities in the computer lab. Students might work together in revising and editing first drafts. One teacher reported cooperative learning activities using modem hookups at home. Students are one-to-one at the computer more often than in pairs or groups.

The fourth grade teachers reported students displaying more initiative to learn and do things when using the computer. "Kids become teachers," one teacher observed. One teacher felt her students displayed more creativity in writing, wrote longer passages, and enjoyed writing more using the computer. She also reported her students were better at math because of computer use. She gave as an example of an area of improvement as long division in math.

One teacher expressed disappointment that the academic software is not at an appropriate fourth grade level. The other teacher specified things needed at home to make home computer use effective. This included four pieces of software: touch typing; math for their level; spelling; and word processing. Additionally, printers are needed at home.

The amount of time fourth graders used computers at home was reported as about 30-45 minutes a day (four days a week) for school-related activities. One teacher uses the computer lab about 30 minutes/day, and the other anywhere from 45 minutes to a half-day/day.

Students:

Both fifth grade students reported using the computer less this year than last. One student liked doing math problems and an estimation activity called "Magic Garden". He said there were good games both at school and at home. The other student likes "Story Board Plus" and drawing with the computer. When asked what they would like to do more of, one student wants to use "Linkway," something they had done a few times last year. The other would like to use computers for spelling more as they had used it for spelling a lot last year and early this year, but not much lately.

Writing with the computer was reported as receiving some attention with the computer. One student talked about writing spelling assignments, but does not write much besides that. The other student talked of writing paragraphs and an autobiography, which his mom thought was really creative. He feels he isn't a good writer, however. Both students reported writing things with paper and pencil, then typing them on computer "to make it look nicer." The two students reported that computers are used for math in one classroom, but not in the other (only math at home with these students). The science software was thought (by the teachers) to be at too high a level, and students reported not using the computer for science.

One student liked using the computer because "it tells some of the stuff teachers don't know." She felt it was a different way of learning and keeps you interested.

Both fourth grade students reported using the computer a lot more than last year. So far this year, one liked math practice best, and the other liked using "Prodigy" at home, lots of games, and "Weekly Reader". One student reported wanting to do more math, and the other more typing.

"Computers are fun because hitting the keys keeps you involved." This student would choose typing rather than writing an assignment. The other student said he would write the assignment, if given a choice. This student said he liked computers because he is better at the computer than other school work. One of the fifth grade teachers reported that all students can do things at the computer, more so perhaps than in other classroom activities.

Fourth grade students reported some involvement in science and health, although the teachers felt the software isn't appropriate for fourth grade. The student from each fourth grade class reported sometimes writing answers to textbook questions using the computer. Spelling was something that both students reported doing. Math was also an activity reported by both students. Both students reported working with databases, and one of the students had done a spreadsheet on M & M's. Both of the students reported that their teachers had used the computer for demonstration, one specifically reporting about "Prodigy" around a single computer.

SUMMARY

In this evaluator's opinion, to even partially meet the goals and objectives for this project (listed in a four-page document) will take a coordinated multi-year effort. The project is about where it can realistically be expected to be at this point. The fourth grade teachers are much more advanced in their computer

applications, and their students seemed much more positive about the computer use. Fifth grade students seemed a little frustrated because of having to go backwards when starting fifth grade as the teachers were new to the project. The fifth grade teachers are feeling the first-year frustrations experienced last year at most project sites. Additionally, they perhaps have higher expectations because of the existence of the project last year in fourth grade.

There does not seem to be a great deal of coordination between computer activities at home and at school. Time reportedly spent by students on computers in the home on school-related activities seems to be at a fairly low level in relation to the potential cost involved in the home software and hardware. However, for teachers to develop both an at-home and lab computer curriculum that correlates with the classroom curriculum is a tall order. The lack of printers at home is a real detriment to fully utilizing the at-home computer's potential.

To develop coordinated uses of the computer, the objectives of the usage category would have to be narrowed considerably. If limited areas of the curriculum were to be stressed and effective strategies, software, and printers were available, then perhaps there could be a coordinated home-school computer project. The development of this project could be assisted by limiting the scope of what is expected and concentrating resources on these narrower goals.

Site:	Indian Creek (Lawrence)
Usage Category:	Buddy System
Site Visit:	June 1, 1990
Field Staff:	Lou Emge

INTRODUCTION

This project, as it is being implemented, is really made up of two separate projects--home use and school use. There is not a lot of connection between home and school uses of computers. The expectation that regular classroom teachers would be able to accomplish the "goals, objectives, and assessment strategies" for the Buddy System without a tremendous amount of planning resources, is unrealistic. The expectation is for a project that develops and implements coordinated computer use in the home and the classroom, both of which are coordinated with the school's curriculum. In this site, they made tremendous strides but could not come close to realizing all of the goals and objectives.

It should be clarified that last year fourth graders had computers, certain software, and printers at home. The computers, software, and printers stayed with the students, as they moved to fifth grade. This year's fourth graders do not have printers and do not have some of the key software (same number of licenses, twice as many computers) that last year's fourth graders had as these stayed in the student's homes as they moved to fifth grade. Consequently, fifth-grade teachers who were inexperienced with computers had printers and a much wider selection of software for their students than the experienced fourth grade teachers. Being new to the project, the fifth grade teachers could not take full advantage of all that was available. Also, much of what the fourth grade teachers had developed last year for at-home use could not be used and expanded on this year because of the lack of programs and printers. Additionally, fourth grade teachers find parents this year not nearly so enthusiastic about having the computers at home because there are no printers.

The IBM computer lab is used by the four teachers in varying amounts and in different ways. The more-experienced (with computers) fourth grade teachers talked of using the lab a minimum of 30 minutes, and often more, almost every day. The fifth grade teachers did not stick to a daily schedule quite as much, but it seems used it more sporadically for project-type things rather than an every day part of their class routine. The fourth grade teachers, who were in the project last year, understandably had a better overall vision of how computer use could be integrated into varying parts of the curriculum. The fifth grade teachers, who are very experienced teachers, were just starting out with computer use. The principal mentioned that their teaching styles were more structured than the fourth grade teachers as well, so finding computer applications did not come easy for them. There did seem

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to be an expanded use of the lab computers by fifth grade teachers as evidenced by their descriptions of ways they have used them since the last visit.

The take-home computers seem to be under-utilized both in time used and in the quality of what is being done. Information on home use was gotten only through probing during the teacher interviews. When teachers described their computer projects and activities, almost all of these were lab/school use. There seem to be different reasons for this at the two grade levels.

Fourth graders do not have printers or subject-area software. Last year's fourth graders did have them, and the teachers had developed things last year based on the available programs and printers. When the the students became fifth graders and retained the same programs and printers, the fourth-grade teachers found that they could not make the same assignments for their fourth graders to do at home. One fourth grade teacher reported two things which indicate there were good things still happening at home with the computers: 1) There is always a line-up of students first thing in the morning for the printer that she has in her room (indicating students are bringing in things on disk that they did at home); 2) recently when home computers were called in for a week to add something to them, she reports hearing a lot of "how am I supposed to do things without my computer?"

Fifth graders' home use of computers is hampered most by the inexperience of the teachers. One teacher said that most of the computer work at home is optional, with a few assignments. The other teacher talked of two or three home assignments/week for which students use their home computers.

The principal, who at the last visit talked about the difficulty the fifth grade teachers were having in embracing computer use for their students, reported that she feels the two teachers are showing much greater receptivity to using the computers and are starting to internalize things on their own. She mentioned again, and not in a negative way, that these two teachers were more structured and sequential in their approach to teaching and found it difficult to assimilate computer use. The teachers spoke with pride of activities and projects for which they were using the computer, and it seemed to make sense to the teachers in the larger context of their role as a classroom teacher. Since the previous visit, there does seem to be real progress in establishing computer use as a significant part of their teaching.

FINDINGS

Teachers:

The fifth grade teachers were asked about personal benefits they have gotten from their first year in the project. One reports now personally using word processing a lot and doing a better job with communications. Having a computer at home has been instrumental to this development. He also says he is a better manager of time, and it is nice to "be in on computers." The other teacher spoke of word processing and time management as well, and also felt she was better able to meet student needs for remediation and/or enrichment.

Benefits to students that were reported by the teachers include: equalization of students of varying abilities; pride in being able to produce a good product; willingness to problem solve and try new things; more independence in figuring out things and helping each other.

Impact of their involvement in the computer project on their regular classroom teaching did not seem significant. One reported "not much," and the other reported more flexibility in grouping and rotating students and managing the day better.

Personal goals for this year's computer involvement, as indicated at the first visit, were for one teacher to carry on the students' fourth grade experience into a smooth two-year program and to learn "Writing Assistant" and "Story Board". The teacher has learned the two programs and feels at the beginning of next year will be able to provide a much smoother transition for the students beginning fifth grade. The other teacher's goals included learning the computer for personal use, more efficient and quicker ways of teaching/learning, and being able to provide more individualization in instruction. Good progress has been made in all three areas. She talked of custom building some plans and curriculum specifically for special education students.

In describing ways that the fifth grade teachers used computers for instruction, one teacher said that computers were used primarily as a tool for projects and as part of regular curriculum. It seems to this evaluator that that was the reason for the appearance of a slow beginning for the two teachers new to the project. They were not interested in computer activities for the sake of using computers, but were looking for applications that fit within their instructional style and mode of operation. One teacher talked of several projects that she had always had students do, but this year incorporated computers into these same projects for word processing, graphing, making presentations using the computer, and utilizing "Prodigy". These were simulations, one creating a space station and putting together a proposal for it to the Federal Government, and the other was a health project on body

systems. She was pleased with what students came up with. There may have been uneven use of computers by students in these projects, however, as computer use seemed to have been an option, rather than required. There was also creation of a database that described characteristics of famous paintings such as colors, medium, subjects, etc.

The other teacher talked of using software that goes along with the curriculum and several projects. One of these was creating the life of a celebrity on eight computer screens, using text and graphics, that depict the life of the person. The other was on oceanography related to the "Voyage of the Mimi". The teacher reported both of the projects involved both home and school uses of computers. Both teachers report students using the modem at home to access "Prodigy".

One fourth grade learning word processing and the graphics of "Story Board" have been very helpful to her. She used "Story Board" for about twelve presentations she has made to groups about the computer project. The other simply said she feels better about her teaching, and she feels her students can do so much more (higher expectations).

Several benefits to students were similar to those shared by fifth grade teachers--equalizing students' ability to accomplish things, students helping other students, and problem solving. Other benefits included improving self-esteem and self-confidence. One teacher said she planned more complex projects because students have access to computers at home and at school. She expects more of her students, and students are meeting her higher expectations.

Both teachers had set as a goal to learn what spreadsheets and databases are all about. One teacher reported that she and her students have worked quite a bit with both this year. The other specifically talked about a heart and pulse rate spreadsheet that her class created and working with existing databases, but not creating new ones.

The teachers also talked of specific student goals. One wanted her students to do correct touch typing and move into word processing and databases and spreadsheets. She reinforces touch typing through a one-day rotation in the lab each week, so students are doing well. Students have worked extensively with word processing, databases, and spreadsheets. Instrumental in meeting these goals has been the five-day activities rotation she uses in the computer lab each week. Students are divided into five groups and rotate each day to a different activity. The five activities are:

- touch typing
- math
- graphics

- data base
- Prodigy

She can work with one small group on a particular activity with five children around a single computer, while the other activities are student/computer-directed. She is very pleased with this lab setup. The other fourth grade teacher has adopted the lab rotation and talks of doing more curricular things in the lab because this software is there, but not at home. Apparently, they only had word processing and drawing capabilities at home, until this spring when the computers were brought in and "Prodigy" and other things were added (apparently as a result of changes in the number of licenses that were procured).

The other teacher's student goals also included proficiency at keyboarding. She feels this has not been accomplished with her students because, unlike last year, students do not have keyboarding software at home. She also wanted students to see how computers are used in the real world, not just for fun and in school. She has had speakers come in, took field trips, and hooked into an earthquake database to help meet this goal with her students. Her last goal was for students to use the computer as a creative tool. She feels students are doing a good job with this, partially because fourth graders do not have curricular software at home like they did last year. They are doing less directly related to curriculum and more of the creative uses of the computer.

One project which involved the computers extensively was an archaeological dig simulation. Students had a "dig" area outside, used the computer to make entries into their own daily log describing their dig experiences, made reports, etc. and ended up with a bound, finished book on the project.

One teacher introduced databases by having students complete index cards with information about animals. Over 300 of the cards were displayed on the bulletin board. The information was loaded into a database to make it more retrievable. This teacher used a lot of drill and practice mathematics in the lab. It was one of her rotation days as mentioned above. Last year her students had the IBM math on their home computers and printers to print it out, so she had students do a lot of it at home. This year she tried to copy things on individual disks for students to take home, but it didn't work very well and without printers made it even less effective. She abandoned this earlier in the year.

She approaches writing as a process. Students utilize the writing steps of: pre-writing; first draft; peer review; and, second draft. Students write a lot at home and at school. As mentioned, students are lined up in the morning to print things that they wrote at home.

The other teacher talked of using the computers and word processing in implementing their whole language approach to reading instruction.

Students:

One student from each classroom was randomly selected to be interviewed. Fifth grade students reported not using the computer as much this year as last and did not mention specific home activities. This is consistent with other findings from the two visits. Fourth graders understandably used the computer much more than when in third grade and more than this year's fifth graders as well. Home use for one fourth grader included going to sports and basketball and getting information on "Prodigy". His father uses "Prodigy" as well. He also talked about doing homework on the computer--spelling and math. The other fourth grader also mentioned math and spelling as well as drawing pictures and "Story Board".

All four students used the computer a great deal for word processing. Writing reports and stories were mentioned most often as writing activities.

When asked what they would like to do more of, one fifth grader talked of wanting to get into more games and better programs at home. Apparently he was hearing from other students that these things existed, but he could not access them. The other fifth grader mentioned "Linkway," which I think allows students to communicate with one another using the computer and modem. One fourth grader would like to do more with "Story Board" and "Story Editor," weaving the two together. The other would like to do more math and more "Prodigy".

What makes computers fun for these students included: better than writing by hand, much easier to write and it looks better; you learn more because you are the main part of it and you can decide what to learn. In the classroom there is no choice. One said that he likes the games and touch typing "to see how fast I can go."

Three of the four students mentioned combining pictures with stories they write on the computer as an activity they have learned with the computer and are very proud of. This seems to say a lot for the power of the computer as a motivator for writing more often and better and for children producing things like they are used to seeing--a combination of text and pictures. One student was most proud of his reading work on the computer because he got 100% a lot. Software specifically mentioned were "Story Board," "Linkway," and "Story Editor".

Students had ideas for what they would do if they were the teacher. One fifth grader would give most of the homework on

computer--"spelling like we used to do." He would also use the computer for making reports and would go to lab at least three times a week for an hour. Friday would be a "free day" at the computer. He talked about doing things like last year when he was in fourth grade. The other fifth grader would spend much more time in the lab, twice a day for one hour each time. She would do more spelling, language, and reading. She would have students make pictures with explanations and use "Writing Assistant" to type out things.

The fourth graders seemed more satisfied with the way they are currently using the computers and their suggestions reflected this. One suggested going to the lab every day for a longer time and doing more with reading and "Story Board". The other, whose teacher gives her students the most lab time, would use computers about the same amount of time but would do more touch typing, "Prodigy," and a little more reading.

SUMMARY

To justify the high cost of home computers, things must be carefully planned. This year's fourth grade experience of not having certain software and printers is an example of doing a half-way implementation. Certainly key software and printers are important factors in effectively using home computers. It does not seem that it is wise to supply home computers unless the student can be supplied with all key elements to effectively use the computer at home to meet the objectives set out for home use.

This is not to say that all key factors are identified by the experience at this site, but it did provide evidence that for them, key elements included printers and certain software. When those were taken away, meaningful student and parent use of computers at home dropped off appreciably.

Also, as mentioned earlier, the project as described by the goals and objectives is very complex. The expectations need to be pared down to focus on achievable goals.

Site:	Washington Irving School #14 (IPS)
Usage Category:	Buddy System
Site Visits:	January 16; May 23, 1990
Field Staff:	Dr. Darryl Strickler

INTRODUCTION

The initial phase of School #14's microcomputer project, a take-home project for fourth-grade students, was implemented as part of the "Buddy System Project" during the 1988-899 school year. The 1989-90 phase of the project involves the use of Apple IIgs computers and related software with fourth- and fifth-grade students in their homes and in their classrooms.

The objectives for both phases of the project were:

1. To use the computer as a tool for enrichment, creativity and productivity;

2. To promote cooperative learning;

3. To use individually-prescribed learning activities at home and at school;

4. To enhance problem-solving and higher-order thinking skills; and

5. To increase parental (and sibling) involvement in students' education.

This report describes the use of Apple IIgs computers with two fourth-grade and one fifth-grade class at Washington Irving School #14 in Indianapolis, and in the homes of the students participating in the project.

The ATI evaluator assigned to the project visited School #14 on January 16, 1990, during the first week of the second semester and again on May 23, 1990, near the end of the school year. Using questionnaires specifically prepared to gather data on the project, the evaluator interviewed two fourth-grade teachers the fifth-grade teacher, the principal, and three fifth grade students.

Scores from standardized tests administered when the fourth graders were in third grade, and when the fifth graders were in fourth grade (in May, 1989), were used as a pretest measure of achievement. These scores were compared to May, 1990 standardized test results for the same students. (See statistical data elsewhere in this report.)

Planning for the 1989-90 microcomputer project at school #14 began late in the 1988-89 school year when it was learned that the

Buddy System would be extended into the fifth grade. And while the fifth graders were allowed to "keep" their computers from the 1988-89 school year, additional computers to implement the fourth-grade portion of the 1989-90 project were not available until January, 1990. During the first visit by the evaluator in January, it was apparent that while the fourth-grade teachers were "ready and eager to get started," their students needed considerable time to become familiar with the computers and their operation. In the fifth-grade class, the situation was reversed; the seven students who had been in the initial phase of the Buddy System Project were very comfortable with using the computers as a tool for learning (and playing) and were leading the rest of the class--most of whom had very little or no previous experience with computers. For her part, the fifth-grade teacher seemed somewhat frustrated and confused about what she was "supposed to be doing" with the computers in the classroom and exactly how to go about it.

During both the pre- and post-interviews, teachers stated that students were using their computers at home to do an average of 30-45 minutes of assigned homework three or four days per week. Fourth- and fifth-grade classes used the computers in their classrooms fifteen minutes to one hour per day, on the average, mostly for assigned and supplementary activities, but also as a "reward" for getting other assigned work finished. Hardware in each classroom consisted of six Apple IIgs computers and a dot matrix printer. Each student also had an Apple IIgs at home, but no printer. Software used in the project included "AppleWorks," an integrated database, word-processing and spreadsheet program; "Paint Works," a drawing and graphics program; "Where in the USA is Carmen Sandiego?", a social studies simulation; a variety of reading and math "skills-oriented" software from Jostens Learning Systems; science and keyboarding software, and various other programs.

In the classroom, students typically worked in pairs at the computers doing specific assignments required by their teacher, or "creative" or recreational activities. For example, the fifth-grade class typically did assigned activities and, during free time, played "Where in the USA is Carmen Sandiego?". Fourth grade teachers appeared to make more specific, convergent-type assignments because of the inexperience of the students, while there seemed to be more experimentation within the fifth grade class--probably because of the extensive experience some of the students had during the 1988-89 phase of the project when the fifth-grade students were in fourth grade. (Most current fourth-graders had no prior experience with computers.)

Teachers:

Because they participated in the Buddy System Project during the 1988-89 school year, the fourth-grade teachers at School #14 were very familiar with the usage category and objectives of their

project and cited their prior involvement as a source of professional growth and "renewal".

During both the January and May, 1990 visits to school #14, it appeared that while the fourth-grade teachers had made considerable growth during the 1988-89 phase of the project, they appeared to have reached a plateau in their use of computers for instructional purposes; i.e., they do not seem to have progressed much beyond where they were at the end of the 1988-89 school year. They also expressed difficulty adjusting to the reduced "traffic through the school" (visitors) and attention they had become accustomed to during the 1988-89 school year. It seemed to one teacher that no one cared any longer. It should be noted, however, that it is, in general, difficult to sustain growth in an innovative project of this type.

Among the fourth-grade teachers, there was little evidence of professional growth in relation to how they used computers in instruction between the January and May interviews. At the same time, the fifth-grade teacher--having the most to learn--seemed to have made great strides at least in her comfort level with the technology, if not in technical and pedagogical expertise. For example, in January the fourth-grade teachers and several students indicated that they wanted to improve keyboarding skills, but by the second visit in May, they appeared not to have made much improvement in this area. As is the case in most schools, too many things compete for teachers' time and attention, and it is difficult for them to accomplish everything they intend to do with their students.

Students:

From observations in the classroom and interviews with individual students, it was apparent that School #14 fourth- and fifth-graders were proficient and comfortable using computers. Because of their more limited exposure and teacher-initiated assignments, the fourth graders seemed to be less creative in their use of the computers than the fifth graders--both during the initial visit in January and also in May.

During the May visit it did not appear that the fourth graders had narrowed the gap at all, perhaps because the nature of their assignments, in general, seemed more convergent and task-specific, while the fifth graders seemed to have been allowed to pursue a number of self-initiated activities and just "experiment" with the computers.

Individual students interviewed in January and May seemed rather confident about their abilities to use the computer as tool, and did not appear to think of it as a "big deal". This attitude seemed prevalent throughout the fourth and fifth grades and appeared to be related to the amount of challenge they experienced.

That is, they may have used the computers for only routine kinds of activities and were, therefore, not challenged sufficiently to try new applications.

SUMMARY

The overall picture of School #14's computer project during the 1989-90 phase is one of mediocre use of technology almost, it seemed, just to fulfill an obligation. The principal, teachers, and students have a sense of having accomplished what they set out to do, but their goals seemed rather non-specific in the beginning. A major goal seemed to be "get through the year" with as little pain as possible. Whether there could have been more progress toward new and innovative uses of the computers during the year is still an open question, but there is no doubt that what has been accomplished has been directly related to the amount of, and to the effort and expertise invested by teachers.

Site:	Blanche Fuqua Elementary (Terre Haute)
Usage Category:	Buddy System
Site Visit:	January 22, 1990
Field Staff:	Anna Weiser

INTRODUCTION

Two of the fifth grade classrooms at Fuqua Elementary School have three Macintoshes and three printers for the students' use, and one for the teacher. They are located to the side of the room. Children work on them regularly, either singly, in pairs, or using cooperative learning techniques. In addition, there is a computer lab that the class uses periodically, so all students get frequent opportunities to be on the computer. In class, it is about 15-20 minutes per day per child. In the lab, it is longer. For some students who come to school early or stay in during lunchtime specifically to use the computers, it is longer.

According to one of the teachers, those students who were in the program in the fourth grade are now becoming very independent in their work on the computer. This year's class members who were not involved in the Buddy System last year are still very intimidated by the experience. It could be that they are feeling inadequate in comparison to those classmates who have already been using the Macs for a year. Additionally, the fifth grades did not receive their computers until the last week of October. Because they were so late in arriving, the teacher was less motivated because she had to wait so long to implement what had been planned.

The fifth grades have switched to "Microsoft Works" and "Hypercard" which the teacher likes much better as they allow much more creativity and flexibility than "Macpaint," "Macdraw," and "Macwrite" which were the main programs used last year in fourth grade.

FINDINGS

Observation:

Students were taking turns practicing their spelling words using "Typewriter," while the rest of the class was working in groups on a social studies lesson. A comfortable noise level with children commenting and questioning was occurring. Most of them paid attention to what they were supposed to be doing, although a few were interested in what was occurring on the computers, since one was turned so the screen faced the class.

Teachers:

The fifth grade teacher is very knowledgeable about all aspects of the project and usage category. Her efforts and direction were outstanding last year and continue to be this year also. She feels very comfortable with the Macintosh and is an enthusiastic supporter of its potential. She indicated that being involved has stretched her professionally. She has made several presentations in front of peers at conferences and that has given her new confidence. She further reports that this project has helped increase her awareness of technology and how it can be used in the schools. A much larger view of what can be done has resulted.

Problem solving is the objective that children will be able to accomplish most effectively because those who have a head start from last year serve as role models to encourage their less able classmates and also work in groups cooperatively. With "Hypercard," students have to figure it out and experiment freely.

With cooperative learning activities, there has been much carryover from last year. Children like to work together and help each other. Sometimes the teacher assigns children to groups; other times they get to choose. In language arts, they work on cluster projects using a theme approach, either independently, or with from two to four children per group. These projects have been very successful, she reports.

There was no training program prior to the project's inception this year. Training is an area that has not been very good, she says. There have been two or three sessions since the beginning of school, but they should have been before school started, in her opinion. She very much appreciates the help and support of Dr. Jim Higgins at Indiana State University who also regularly communicates with the students by modem, providing them puzzles to solve. Networking has occurred primarily with colleagues at Fuqua who were involved last year.

Prior to becoming involved in the Buddy System, this teacher was a very traditional teacher with lots of teacher- directed control in her classroom--seats in rows, children quietly working on the same assignment. She reports that this project has forced her to become more flexible and tolerant of noise and movement.

In addition to the uses of the computer for spelling, students worked on cluster projects, where children wrote a story from a theme or made up a skit for which they wrote dialogue or created a catalogue of information; energy posters for science; and illustrated summaries using "Macpaint". Students also engaged in writing business letters, studying parts of speech, and practicing adjectives and adverbs to use correctly in their cluster project writing.

There is more writing going on this year compared to last, according to the teacher, especially among students who were involved in the project last year. However, she is not sure if it is because they are more confident or more mature. Students also are required to keep logs of thoughts and activities.
The greatest amount of instructional use so far has been in keyboarding instruction and student word processing. There has been some teacher demonstration and a little programming instruction and computer-assisted practice. They have not done any simulations or used thinking skills software. The LCD has been used for whole class instruction; children can also come in early and print out their homework from their disks. The computers are also used as reinforcement. The teacher seems to have integrated its use in a variety of ways into the curriculum.

As instructional support, the utility software and teacher word processing have seen the greatest use so far. There has been some on-line database searching and telecommunications with Dr. Higgins at ISU. A little desktop publishing has occurred.

The teacher has seen some significant effects on students, particularly in the area of self-esteem. Papers printed from the computer have a nicer appearance, and no one is concerned about a lack of neatness or poor handwriting. Since children have had to communicate with lots of adults and even show college students what they could accomplish on the Macintosh, it has made them feel important and competent. One student who has memory/attention problems has more confidence in himself because of the look of his work printed on the computer. He more readily tries and completes work than at the beginning of the year.

Because of the telecommunication capacity of the computers, students have been keeping track of places on a map, which has increased their appreciation of the vastness and their knowledge about the United States.

The teacher feels that work habits for some students have improved as a result of using the computer. She thinks they have become more organized and that they lose fewer homework assignments. Problem-solving skills have been reinforced. One child used "Macdraw" to make a picture of a sports car by a lake for a cluster project and figured out how to flip the image so that the car would also be reflected in the lake water. It is in the use of the Macintosh for creativity that the most exciting things occur. Students have used it to create stories or "Hypercard" stacks.

The teacher hopes to train students on how to use the database and spreadsheet and how to make stacks in "Hypercard". These are personal priorities for her also. Using "Hypercard," they intend to enter items in the media fair in the spring. They also will be producing books for a display at a book fair at a local mall. A

science fair will also benefit from a Hypercard demonstration in the spring. Additionally, students will be spending more time on creative writing.

Students:

The students interviewed were in the Buddy Project last year, so the amount of computer use has not changed much. They are comfortable using the Macintosh. One indicated he liked "Hypercard" the best because he enjoyed making the stacks. The other liked "Macpaint" best because she likes to draw a lot, as did her brothers. So far, each has written one story independently in class after handwriting a draft, but one said he had written several at home. They have practiced math problems, worked on learning to type without looking at the keyboard, science and social studies lessons, practiced spelling words, wrote answers to textbook questions, and done some problem solving and simulations.

Both students indicated they would like to learn more about "Microsoft Works" and get "Superpaint". Both children were positive about using the computer for writing. "When you're typing, it's lots faster and your hands don't get so tired." "When I write and there's wrong marks, I can just delete."

What is more difficult is using the mouse, according to these students, because it's harder to control. It's also harder to draw with than a pencil.

Both students preferred to work by themselves because more was accomplished and neighbors were not quarreling over whose turn it was. One student felt he was able to think better by himself. He also indicated that he felt real good about having one to use at home because he shares with his father and step brothers. He sees it as special because not everyone gets to have one.

SUMMARY

The fifth grade students and teacher already have had almost a year's experience on the Macintoshes. Because children had to wait until almost the end of October for the computers to arrive, both they and the teacher lost some enthusiasm for getting started that only now is beginning to be overcome. Experienced students have been both role models and helpers for those less knowledgeable; the latter were somewhat intimidated by their peers' accomplishments.

The teacher has been able to take the class to the computer lab, so they get a lot more time to use them than just staying in the classroom would allow. She feels this is a drawback of only having three available all the time. Changing to "Microsoft Works"

has been a positive experience in that it allows greater creativity and flexibility of use. The teacher is very dedicated, knowledgeable, and has spent a great deal of her personal time in making the program successful. She also has had good support from her principal and a media specialist.

Site: Blanche Fuqua Elementary (Terre Haute)
Usage Category: Buddy System
Site Visit: May 17, 1990
Field Staff: Anna Weiser

INTRODUCTION

As part of the Buddy System last year, children have had Macintosh computers to use in the classroom and one at home. In the classroom, they are situated at the side where children work on them individually and in pairs, using cooperative learning techniques. There has been an emphasis on problem solving. Children spend on the average, 3/4 of an hour/day individually. In groups, they work about 15 minutes per day.

The main difference between this year and last year is the two year's experience that some fifth graders have had because of their participation as fourth graders. They have had quite a bit of experience at this point, allowing them to be much more proficient in using the Macintosh in a variety of ways in comparison to those who started out this year. While those new to the program are catching up, they have not reached the sophistication level of their peers. The other main difference is the switch to "Microsoft Works" and "Hypercard".

FINDINGS

Fourth Grade Teacher:

As a participant in the Buddy System for two years now, the fifth grade teacher is very knowledgeable of the usage category and how to integrate the computer into the classroom. She feels they have worked on all goals, but problem solving was accomplished the best because all the assignments involved that, and many of them were the kind that students had to figure out and implement themselves.

The teacher reported that the greatest benefits to her have been the opportunity to grow professionally. She has attended conferences, published an article in T.H.E. Journal and made presentations. As a result of learning lots more about the Macintosh and its potential, she has become more computer literate.

Computers have been successfully integrated into all areas of the curriculum, including math, with graphing, fractions and factoring. The teacher would mention a concept or subject and then children would think of ways to use it. For example, with spelling, children had to complete a word search, categorize the words, and divide them in syllables. Where they asked to

alphabetize the words, they figured out how to enter them into the database which then did the alphabetizing for them.

In reading, with the cluster projects, students had to draw or scan a picture related to their chosen theme and present it to the class. In math, students worked on grids and graphing. They plotted each other's fractions, drew shapes, divided figures into parts and made factor trees. In social studies, using two cards for "Hypercard" stacks, they created databases on presidents, individual states information, Revolutionary War battles and timelines. For science, students performed experiments with electricity, drew circuits, atoms and molecules, physical and chemical reactions. They also worked on word processing while writing their science fair projects. In geography, students used the telecommunications network and then plotted the longitude, and latitude on the earthquakes map to identify where people live who also use Applelink. For a health unit on self-esteem, children drew pictures of how they saw themselves in their families.

A major change in her teaching according to the teacher is an increase in flexibility. She has gone from an authoritative person in the classroom to one with greater tolerance of the freedom children need to work effectively with the computers. Children use the computers when they can, print when they can. The noise level in the class has increased considerably. Children have been involved in many projects requiring thinking for themselves. They have been writing, drawing, using "Hypercard," figuring out how to get the computer to do what they want it to do.

The other major change has been in the use of cooperative learning which the teacher says the children do very well. The emphasis for the children has been on accomplishing their project or task, which has made it easier for them to tolerate less desireable classmates. The teacher has been a strong role model. Students worked on cluster projects and databases cooperatively. Many of them figured out how to do this themselves.

Organizational patterns have included 1:1, small group, and whole class. The most effective use has been in the lab with all students at a computer or using the large screen for instructional purposes.

The most important occurrence that the teacher has seen happening, especially for students who were involved last year and have achieved greater independence, is their initiative in trying things for themselves. They don't need a teacher's reassurance for everything and are more likely to risk things on the computer as well as in their other schoolwork.

With creative writing, children are likely to write more using the computer than with pencil and paper, especially those whose handwriting is poor. Their drawing has become more creative. Some children have composed right at the keyboard; others have written a pencil and paper draft first.

The modem has been used daily. Dr. Higgins of ISU has sent riddles for them to solve regularly. They have done a daily earthquake search. They often use Applelink communicating with other children and adults. Telecommunications has been very important this semester. Children in the fifth grade teacher's class participated in an Academic Bowl where they earned second place out of 13 schools.

Extensive use of teacher demonstration has occurred. Among those items demonstrated has been how to put together a database and how to make a "Hypercard" stack. Keyboarding instruction and student word processing has occurred often, along with the use of the database. All categories of instructional support except graphics production have seen extensive use by the teacher.

Two important benefits to students have been an increased awareness of how technology is being used in the world which has also led to an expanded world view. Being able to talk to people all over the United States as they charted earthquake movements, made places outside of Indiana more meaningful to them. They also felt good knowing they were becoming better prepared to deal with the new technology of this expanding world.

A very significant change occurred with one student who had low self-esteem and low confidence. He became a class leader as far as the computer was concerned. He was willing to give the teacher and students his ideas, share thoughts and initiate conversations about non-computer topics, which he hadn't been able to do before. Another child has come out of her shell a little and feels more capable herself because she can tell other students how to use the computer. This is something she would not do before. Children have been more creative, can express themselves more easily on computer and are more proud of their efforts.

In reviewing her goals from the first semester, the fifth grade teacher feels she has accomplished much, but not as completely as she had wanted. She and the students have completed their "Hypercard" stacks on the United States, but not those on Civil War battles and generals. She put together a geography unit on earthquakes and plate tectonics with Microsoft telecommunications to access the U.S. Geological Services to learn about daily earthquake activities. She intends to submit this to the Kranme Awards Competition (a geographic maps and globes manufacturer).

Goals set for students included using the database which was accomplished and the spreadsheet which was not. About half the students were successfully trained on "Hypercard" and are capable of using it and understanding it. Scheduling difficulties prevented their participation in the media fair. One other major goal that was not achieved was telecommunication with parents which was to result in increased parent interaction with school, each other and their children. They also need cooperation with GTE or an independent company in order to communicate with IBM sites. The modems are at Fuqua and with parents, but the software is not available.

Fifth Grade Teacher:

The objective that this teacher thinks has been accomplished most effectively this year is creative writing. Students have not only written more, but improved in expressing themselves. They have been able to do this without having to write it on paper first. They have enjoyed seeing their words printed which has helped to make the experience more meaningful to them and more like "real writing". The objective that was the most difficult to achieve is improving math skills because the software they had didn't really make a difference. Children didn't see the computer as appropriate to use in math. This seems to be reflection of a teacher who is new to the project this year and sees the emphasis in math on skill-drill, as opposed to the creative kinds of things that can be done. He also probably has not had the time to review the huge amounts of software available to accomplish his goal.

The greatest benefits the teacher has received personally have been keeping track of grades and improving his skills and comfort level in using the computer. He feels much more relaxed in letting students do things for themselves. This has been an area where his teaching has changed too. In becoming more flexible, he has been able to allow children to continue working at the computer while he was instructing in some other area, supervising and trusting and expecting that they would make up the work at a later time.

In addition to much creative writing, students have practiced spelling words on the computer. The teacher questions the effectiveness of this and intends to use 1,000 most frequently misspelled words next year instead. The students have made "Hypercard" stacks in science and social studies, worked with Dr. Higgins at ISU, and used file saver for writing and printing.

Cooperative learning experiences have occurred with "America On-line" and sometimes helping one another with spelling of words for their writing. Students have composed on the computer and also after writing on paper. Their writing has improved, but

there is lots of room for improvement, according to the teacher. The modem has not been used on a regular basis, except for "America On-line".

Children had extensive keyboarding instruction at the beginning of the year, and since then have also had much programming instruction and student word processing. There has been moderate use of computer-assisted drill and practice, teacher demonstration, simulations and thinking skills software. The teacher has written tests on computer, had the children answer the tests on the computer and had their answers printed out. He has also used the other categories of the instructional support moderately, including writing reports, letters, grades, and graphics productions for grade ranges.

The greatest benefits to his students are in pupil growth and enthusiasm. Children are now able to put their lessons and assignments on computer and print them out. Some students are more excited about using technology and the different things that can be done on the computer such as "Hypercard". One child is building more than one stack. When their work is finished, they frequently ask if they can work independently on the computer.

The teacher sees improvement in students' grades in science, social studies, and health because children are willing to put their notes on the computer so it makes them easier to read when preparing for a test.

Creativity has been shown when students make illustrations for stories or assignments such as creating a logo and slogan for a safety button. The teacher's directions were general, and the children became very imaginative. In the area of problem solving, the teacher says the students have been able to take each other's ideas, critique them and make them better. In their writing, he has noticed that they use a variety of synonyms and varying sentence structure.

As for personal goals, there are still areas that this teacher thinks he needs to improve, but he knows he has gained a great deal. He does not have to rely on the students to reassure him, or if he asks a question, they can simply tell him instead of having to demonstrate. He has very much appreciated the opportunity to be part of the project, even though he has not always been comfortable with certain aspects of it. His knowledge base has expanded. He feels he can use the database and spreadsheet much more comfortably. He is building a database in science on vertebrates where children have been adding information.

Student goals were achieved for the most part. They wrote stories for the Book Fair, printed them and drew illustrations using "Macpaint". In health, the children had to design a safety

button and draw it. One of the greatest successes was by a child who is learning disabled and had difficulty writing and drawing. But on the computer he was able to complete the task nicely.

Fourth and Fifth Grade Students:

The two children who participated in the Buddy System last year said they had about the same amount of computer use this year as last. The third child, who indicated he used his grandmother's Apple IIgs in fourth grade, said he had a lot more use this year. The two boys were most enthused about using "Hypercard" because of all the different things that could be done with it. The third child said she liked "America On-line" best because "you could talk to people all over the United States without having to go there and meet new people." She liked the idea of being able to send mail by computer.

The things children had done the most included playing word or number games, practicing spelling words, working on the database (and on the spreadsheet, said one), problem solving games and watching demonstrations. Two of them were most proud of having learned how to use "Hypercard" because of the variety of things they could do with it. It was also perceived as difficult and just being able to learn it was seen as an important accomplishment as well as being able to teach it to a mother.

Difficulties with using the computer related mostly to the mechanics, such as finding the right keys fast enough or remembering your disk in order to turn in your homework or getting into the middle of something and making a mistake.

Two children agreed that working by themselves was preferred when you were writing when there was the thought that your partner wouldn't like what you wrote and criticize. The third was more interested in being able to share information and get help from a partner when working together.

Students who were interviewed who had been in the fourth grade Buddy System class last year were among the more sophisticated users of a Macintosh. They were also enthusiastic about "Microsoft Works" because it was new to them, and it has a great variety of things on it that they could do.

When asked to describe what they were most proud of, students had separate responses. One child was happiest about making his safety button using "Hypercard". Another said she preferred the "Microsoft Works" because she had learned a lot on it. The third was proud because, using Microsoft, he had been able to do something that no one else had done and put it on the front of his book.

Two children had written stories on the computer after first writing them on paper. The other had composed right on the computer. Their responses were varied regarding what the class had done on the computer. The only items all three agreed upon were: write stories, write answers to textbook questions, work on a spreadsheet, and observe and experiment or demonstration. One had practiced math problems by using the calculator on the computer, played word games and learned science lessons. The main goal they all wanted was to use "Apple Talk" and get on "America On-line".

Using the computer for learning is fun, according to these students, because your writing looks neat and you can accomplish more things faster than regularly. The difficulties included losing things because you hit the wrong button, getting commands you don't understand, having to be careful with the printers, and dealing with the times when something happens to the drive, and you can't put the disk in when you want to.

All three students preferred working by themselves to avoid fights and having to put up with disagreements or putting ideas into the work that you don't want included. Asked to describe their ideal situation, none of them said much beyond what they had experienced: three to five computers in a classroom with one per student to take home.

SUMMARY

As described earlier, major changes this year have been the increased sophistication of students who have now been in the program for two years and the switch from "Macdraw," "Macpaint," and "Macwrite" to "Microsoft Works" and "Hypercard". The teacher continues to grow professionally and develop her own computer use and instruction skills. Because they have had access to a computer lab, they have not felt the limitations that are sometimes occurring in classrooms where there are only a few available.

All the teachers last year, the principal, and the media specialist, agreed that timing has been a very serious flaw in the implementation of this project. They recommended that decisions be made earlier in the spring so that all that needed to be done could be implemented earlier so that it would be in place and operational when children started school in the fall. They all experienced much frustration and this year--anger--that these recommendations were not acted upon last year. The same delays seem to be occurring this year. Independently, they have already started preparing those teachers who will be involved in the project next year. There is a core of dedicated, knowledgeable people at Fuqua who are determined that this will be a successful project for students, parents, teachers, and the

community. They also know that waiting until early September prevents the implementation from being as effective as it can be.

VIDEO DISC

Site:	Center Grove Elementary
Usage Category:	Video Disc
Site Visits:	January 19; May 8, 1990
Field Staff:	Dr. Darryl Strickler

INTRODUCTION

The initial phase of Center Grove School District's Video Disc Project, which involved the use of video disc courseware on fractions with fourth-graders, was implemented during the 1988-89 school year. The 1989-90 phase of the project involved the use of earth science courseware with fifth-grade students.

The objectives for both phases of the project were:

1. To demonstrate to teachers how video disc technology can be used to improve science and math instruction;

2. To improve the attitudes of both teachers and students toward math and science, especially in the elementary grades;

3. To provide teachers with a vehicle for improving their teaching skills in the areas of math and science;

4. To study the effects of video disc-based instruction on a variety of student groups; and

5. To improve the science curriculum by using video disc as the main delivery system.

This report describes the use of commercially-prepared video disc courseware, "Earth Science" (Systems Impact, Inc.), with four fifth-grade classes at Center Grove Elementary School.

The ATI evaluator assigned to the video disc project visited Center Grove Elementary School on January 19, 1990, a week after the use of the "Earth Science" courseware had begun, and again on May 8, 1990, during the final weeks of instruction. Using questionnaires specifically prepared for the video disc project, the evaluator conducted pre-post interviews with the fifth-grade teacher, the principal, and with three fifth-grade students.

In January, 1990, the teacher began using the "Earth Science" courseware in four departmentalized fifth-grade science classes (N = 96) at Center Grove Elementary School. The courseware includes thirty-five, 45-minute lessons on video disc and related print materials designed for secondary and college-age students. Although the course was designed to be used with older students five days a week for seven weeks, the teacher elected to extend the course to 18-weeks to allow his fifth-grade

students more opportunities for review and mastery of the course content. (The lessons were completed in May, 1990.) The teacher used the courseware in the manner in which it was designed to be used--with the whole class for initial presentations, and with small groups for review and make-up sessions.

Teacher:

Although he did not participate in last year's CAI study, the teacher used video disc courseware during the initial phase of a video disc project at North Grove Elementary during the 1988-89 school year. He was, therefore, very familiar with the usage category and purpose of the project and cited his prior involvement as a source of professional growth and renewal. He believes that he received "good training," "lots of support," and sees video disc-based instruction as "a way to reach more students."

During the post-course interview, the teacher reiterated the fact that the video disc instructional materials he had used throughout the semester gave him "a new way to teach earth science." By direct observation and from his own statements, it is obvious that the teacher is very comfortable with video disc courseware and hardware and its application in instructional settings. (He has also trained students to use and be comfortable with the equipment.) Not only had he successfully integrated the video disc courseware into the second-semester earth science curriculum, he appeared to have actually built the curriculum around the courseware.

The teacher appeared to place a high priority on cooperative learning among his students. He developed activities and arranged the class schedule to accommodate a variety of such activities. His cooperative learning groups consisted of four students--two of average ability, one of below-average ability, and one of above-average ability. Group members were changed every six weeks. The teacher believes that cooperative learning activities benefit his students in important ways and that such activities place greater responsibility for learning where it belongs ... on students. During the post-course interview, the teacher stated that the video disc courseware provided "a new method of doing cooperative learning."

Students:

The teacher believes that his students' attitudes toward learning have improved as a result of using the video disc courseware. He stated that the cooperative learning activities he used in conjunction with the courseware added interest and reduced "pressure for grades," while providing added incentive for students to take notes effectively and discuss course content with their classmates. During the post-course interview, he

stated that students continued to take notes and work well in cooperative learning activities. The three students interviewed shortly after the course began and again at the end of the course (one each of high, average, and lower ability) seemed to agree with the teacher's assessment. They described the course as "interesting," "fun," and used other superlatives to describe their involvement in the course. They thought the video disc "explained everything clearly," appeared to appreciate the cooperative learning aspects of the course, and felt that these were beneficial to them.

Potential problems of boredom and overlearning were not apparent among students. They seemed to enjoy the course and the opportunities it provided to learn earth science and work with other students. There was also no indication of a problem arising from the fact that the materials were designed for older students.

SUMMARY

From all indications, the current phase of Center Grove's Video Disc Project was "well begun" and "well done," with teacher, principal, and students indicating their satisfaction with the way things worked in the current phase of the project. Nothing in the January or May interviews and observations seemed to indicate otherwise.